

ANNALS
OF
OTOLOGY, RHINOLOGY
AND
LARYNGOLOGY

INCORPORATING THE INDEX OF OTOLARYNGOLOGY.

VOL. XXX.

DECEMBER, 1921.

No. 4.

XLVII.

NEURALGIAS OF THE TRIGEMINAL TRACT AND
FACIAL NEURALGIAS OF OTHER ORIGIN.
IMPRESSIONS DERIVED FROM A
SURVEY OF 555 CASES.*

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One would expect a surgeon's thesis on the subject of facial neuralgia to deal exclusively with that particular type of neuralgia which responds to surgical treatment, and while I will present my operative experience with the major neuralgias, I should like on this occasion to include observations on certain other forms of painful affections of the face, that are of interest both from the standpoint of diagnosis and treatment. There has been much confusion in the terminology; the terms "facial neuralgia" and "trigeminal neuralgia" have been, un-

*Read before the meeting of the American Laryngological Association at Atlantic City, May 31, 1921.

fortunately, rather loosely used, sometimes to indicate merely certain painful zones in the trigeminal distribution, sometimes that specific form of neuralgia first described by J. Fothergill in 1776. Even for the latter, one finds in the literature a great variety of terms, such as "tic douloureux," "epileptiform neuralgia," "surgical neuralgia," not to speak of the terms of earlier writers, such as "trismus dolorificus," "la grande neuralgie," and so on. Major trigeminal neuralgia is the term I would propose as descriptive and distinctive and in order that there may be no misunderstanding as to what is implied I will briefly sketch its distinguishing and characteristic features.

Appearing suddenly and without any apparent exciting cause and with few exceptions after middle life, a sharp, shooting, stabbing, lancinating pain is experienced, at first in one of the three divisions of the trigeminal nerve, usually the second or third. The pain is likened by the patient to an electric shock, to a boring hot iron, to the tearing of flesh. The distribution of the pain has definite anatomic limitations, and without variation is referred to the terminal distribution of the nerve involved, to the lips, gums, tongue, teeth, nose, forehead. The pain comes as a bolt from the sky and vanishes like a shooting star. We speak of "attacks" as indicating certain periods of time during which the patient is subject to paroxysmal seizures. The attacks are of varying duration, a week or two at first and two or three in a year, but as time goes on the attacks are of longer duration and of greater frequency. I recall one unusual exception when the patient, whom I first saw at the age of 80, had experienced pain not more than a week in any one of ten years until the last attack, which had persisted for five weeks. During the attacks there are a series of paroxysms of short duration, usually a fraction of a minute, and of varying frequency. The paroxysms may be spontaneous, but they are almost invariably induced by talking, eating, swallowing, by hot or cold drinks, by draughts of cold air, by sudden noises, as the slamming of doors, by the slightest touch of skin or mucous membrane. The face cannot be washed or shaved, the teeth cleaned, the hair brushed, the nose blown; eating or drinking is out of the question. Between the paroxysms the patient is pain free,

although complaining at times of a sense of soreness in the painful zones, and in the interval between attacks there is not a vestige or suggestion of the painful phenomena. Usually, but not invariably, patients enjoy comparative freedom from pain during the night; as a rule sleep is not disturbed. In intensity there is nothing comparable to the pain of trigeminal neuralgia unless it be the paroxysms of a tabetic crisis. The pain of renal and biliary colic is of great intensity, to be sure, but controlled at least in part by morphin. Not so the pain of trigeminal neuralgia. The habitual use of morphin is presumptive evidence that the patient is not a subject of the disease under discussion. There are certain motor, secretory and vasomotor phenomena which are only of incidental interest. This sketch, though very brief, suffices for our purpose, but that there may be no misinterpretation, permit me to mention certain facts that are of value in the differential diagnosis. A diagnosis of major trigeminal neuralgia is not justified when there is an associated area of anesthesia or hyperesthesia in the trigeminal zone, when the pain is continuous and not paroxysmal, when in the early stages there are not intervals of complete freedom, when the pain does not correspond to anatomic zones, when the pain is not referred to the terminal areas of nerve distribution.

The most important differential diagnosis to be made is between those cases which might be said to be of organic origin and those which are functional. The latter is a term that must be accepted as quite elastic and is used to include the psychoneuroses or the psychalgias. The differential diagnosis is important, because not only will the pain in the functional case not be relieved by operation, but the patient will complain as much, if not more, after the operation than he did before. I have seen a number of these neuroses, and I regret to say operated upon two of them.

SUMMARY.

A patient with severe boring pain in cheek, of intense degree and nine years' duration, after resection of two-thirds of the ganglion complains of as much pain as before operation; but after the operation the most intense pain is referred to a new territory.

Case 1 (File No. 63183). Aged 52, was admitted to my service at the University Hospital with a provisional diagnosis of trigeminal neuralgia. The maxillary antrum had been drained seven years ago, although at the time there was no evidence of infection, and had been discharging off and on ever since. A number of teeth had been extracted. The pain was described as boring, with a sense of pressure, and was referred chiefly to the region of the cheek and malar bone and occasionally to the border of the mandible. To be sure, the pain was not paroxysmal, but it was so intense that the patient was quite demoralized and pleaded for some radical means of relief. Rather against my better judgment, I finally decided to operate, and inasmuch as there was no pain referred to the ophthalmic division I resected the maxillary and mandibular portions of the Gasserian ganglion.

The result was as should have been anticipated. The patient stated after the operation that he had as much pain as he had before. But note that after the operation the pain was referred chiefly to the brow and the temple. While he admitted the pain in the cheek was better he was very positive in his statement that on the whole he was just as miserable as before the operation. Perhaps it is easier to say what the patient did not have than what he did have. He did not have major trigeminal neuralgia, and the fact that he complained so bitterly of pain after the operation in regions of which he did not complain before should justify one in stamping the case as a neurosis. Perhaps this may be a convenient term with which to screen our ignorance as to the origin of some of these obscure pain phenomena.

That pain should be a conspicuous feature of herpes zoster one can readily understand. Not only is pain experienced during the initial illness before and after the appearance of herpetiform eruption, but in exceptional instances it persists for many years, not only in the zoster of trigeminal distribution, but in those of the intercostal nerves. Postherpetic neuralgia must be, however, a very unusual sequel of herpes zoster. I have seen but two cases as affecting the intercostal nerves, and but one case of 520 trigeminal neuralgias.

SUMMARY.

A case of postherpetic neuralgia of five years' duration, characterized by constant pain of great severity and hyperesthesia in the first and second divisions.

Case 2. The patient, aged 66 years, had had, five years before I saw her, herpes zoster in the distribution of the supra- and infraorbital nerves. This was followed by an attack of erysipelas. The pain was described by the patient as dull, as a "constant ache"; it was referred to the cheek, the upper lip, the ala of the nose, and when she brought her tongue in contact with the roof of her mouth it excited pain and a sensation as "though her face was going to sleep." There was a sensation as though there was a pressure in the orbit from behind, and the skin in the region of the first and second divisions was hyperesthetic. While of greatest intensity during the initial "zoster" attack, it had been more or less constant ever since.

The hyperesthesia of the skin, so conspicuous in this case, I have observed as an equally conspicuous feature in the postherpetic intercostal neuralgias. Theoretically, one might assume that, of all forms of neuralgia, the radical operation on the sensory root would be peculiarly appropriate in those of herpetic origin, where the lesion is believed to be in the ganglion. There are reasons, which I will not here go into, questioning the soundness of this seemingly logical deduction, and on that account I recommended for my patient an alcoholic injection rather than the major operation.

The neuralgias due to tumor invasion may be confused with the major trigeminal neuralgias. The pain, should the tumor involve root or ganglion, is often paroxysmal, and in other respects the resemblance is quite striking. There are, however, points of distinction which, if not overlooked, are sufficient for purposes of differentiation, chief among which with tumors are the objective sensory disturbances, hyperesthesia or anesthesia, in some portion of the trigeminal distribution. We have seen in our clinic examples of these neuralgias from tumors involving the sensory root, from tumors originating in the ganglion or its dural sheath, tumors of the middle fossa

with secondary invasion of the ganglion, and from tumors, extracranial, invading one or more of the three divisions. One of the most interesting of these was a tumor of the cerebello-pontine angle in a patient who, for six years, had undergone a number of operations on the supposition that he was suffering from tic douloureux. (This case was reviewed by T. H. Weisenburg, *Journal of the A. M. A.*, May 14, 1910.)

We see frequent references in literature to the relief of the "major trigeminal neuralgias" by operation upon infective sinuses or by the treatment of dental infection. Is the neuralgia accompanying or following sinus infection one and the same as the major trigeminal form? Or to put the question in another way: Is sinus infection a recognized and accepted cause of the major trigeminal neuralgia? I scarcely venture to express an opinion before this distinguished group of specialists. On previous occasions, I acknowledge having stated in positive terms that peripheral infections, including sinus disease, played no part in the etiology. These convictions have been forced upon me by a critical analysis of my clinical experiences. On my records there are only three instances in which either at the time of my first observation or previous thereto had the patient been under treatment for sinus disease. I have not included cases in which sinus operations have been performed needlessly merely because no other apparent cause of the neuralgia could be found. That sinus infection gives rise to pain there is no doubt, but does it cause the "major trigeminal" variety? I suppose in rebuttal one might argue that my experience with the neuralgias caused by sinus infections has been limited, because the majority were relieved after sinus drainage at the hands of the rhinologist.

The following case I may quote, merely because the exception proves the rule:

Case 3. Aged 62 years. The patient was referred to my service at the University Hospital by Dr. J. M. Robinson, with the following history: She experienced her first pain—a fine needlelike prickling on the left side of the nose—nine years ago. A tooth was extracted but without relief. After a year of pain, in attempting to avulse the infraorbital nerve, the surgeon opened the maxillary antrum accidentally and saw pus escaping. Drainage continued for two weeks, and the

sinus and wound were closed in six weeks. Two years later the infraorbital foramen was plugged and the antrum drained again; at first through the alveolar process, then through the nose. From that time on there has been no evidence of active infection in the antrum, but the pain soon spread to the third division. In the year prior to her coming under my observation she had had three severe attacks, a number of minor ones, and more or less continuous pain in the intervals. The attacks and paroxysms were in every respect characteristic of the major type of neuralgia. Her physical examination was negative except in so far as the roentgenogram showed a cloudy shadow of the left antrum. Even in this case the question might arise as to whether the infection was primary or accidental. At all events the pain was not relieved by the drainage operation.

What has been said of sinus infection might be said with equal force of dental infection. To be sure, the majority of cases upon which I have operated have had many teeth extracted, but in many instances there has been no evidence of infection. Sound teeth have been recklessly sacrificed, often upon the insistence of the patient, but frequently, I am afraid, at the suggestion of the dentist, because the pain is referred to or seems to be begin in one or two particular teeth.

Such evidence as I have presented or might present as to the etiology of the major neuralgias is, I confess, of a negative character. For a hundred years and more the etiology has been a matter of speculation, and we are as far today as ever from any clear cut conception or any convincing data as to the prevailing cause. Admitting, for the sake of argument only, focal infections as factors, why should these neuralgias be more common on the right than on the left side; why in the old rather than the young? The following is a table showing its prevalence in middle and later life.

In a series of 275 operations:

Number of cases between 20 and 30 years of age.....	9
Number of cases between 30 and 40 years of age.....	21
Number of cases between 40 and 50 years of age.....	71
Number of cases between 50 and 60 years of age.....	74
Number of cases between 60 and 70 years of age.....	71
Number of cases over 70 years of age.....	29

If, as I sometimes think, vascular changes, arteriosclerosis, fibrosis and a secondary anemia are causative agents, why is the disease so conspicuously a unilateral affection? Heredity has been said to play a part, but the facts do not substantiate this presumption. As a striking exception I may refer to a family under my care, a large family, to be sure, as there are twenty-two children, in which the mother and three children were victims. There have been only five bilateral cases in my entire series.

There are a great many instances of painful phenomena of the face, call them neuralgias if you will, that are associated sometimes with headaches, sometimes with hemicranias. While it does not clear up the etiology or pathology to classify them as migraine, this seems to be a common practice. I have been intensely interested in these migrainous cases, not so much so from the standpoint of accompanying headache as from the associated exhibition of pain in the face. The vasomotor disturbances one sees in migrainous subjects, as expressed by the sudden pallor or sudden flushing of the face, the pupillary dilation, the salivation, we must admit are expressions of some derangement in the function of the sympathetic system. If this be true, has the sympathetic system anything to do with the pains or neuralgias of which these people complain in no uncertain terms? The following case will serve for purposes of illustration, although strictly speaking, it was a case of ophthalmoplegic migraine:

SUMMARY.

An ophthalmoplegic migraine with intense pain in eye, temple and cheek, unrelieved by alcoholic injection, but immediately relieved by cocainization of the sphenopalatine ganglion.

Case 4. Aged 55 years. Patient was sent to my clinic at the University Hospital as a case of trigeminal neuralgia. The essential features of the case were these: Ever since girlhood she has been subject to sick headaches. These headaches usually lasted two or three days, recurred about twice a month and were usually induced by excitement or fatigue. About two years before admission she had had an acute tonsillar infection to which she attributes her subsequent pains and aches. Two months later she developed a hemicrania and a diplopia, and a month later violent pain in the right temple and eye.

The pain usually started in the temple and radiated to the eye; it was sharp and, as she said, "terrible at times," and would last for days at a time. There was no pain referred to the teeth, jaws, lips or tongue. The pain was aggravated by fatigue, worry and anxiety and relieved by morphin. I saw this patient daily for four weeks. There were times when she complained of headache and pain in eye and temple, times when she complained only of headache alone or of pain in eye and temple alone. There was nothing revealed in a most intensive study other than the unilateral oculomotor palsy, and this, unlike most cases of ophthalmoplegic migraine, was permanent and not transitory in character.

Now it is rather interesting to note in this case that at such times as her pains were unbearable, when I cocaineized the posterior tip of the middle turbinate and indirectly the sphenopalatine ganglion, the pain within one or two minutes entirely disappeared. Can we draw any conclusion from this in building up a sympathetic hypothesis?

The relief of pain by cocaineization of the sphenopalatine ganglion in this case brings to mind that pain picture out of which Sluder has constructed what he believes to be a clinical entity and to which he has given the name "nasal ganglion neurosis." I must confess in the five hundred odd cases of neuralgia that have come to my notice, not one conforms to the type as Sluder describes it with the dual picture of algesic and vasomotor phenomena. I might refer to the following case, which, though by no means a precise prototype, was relieved by alcoholic injection of the nasal ganglion.

SUMMARY.

A patient with neuralgia of the face of 12 years' duration complained of pain in eye, nose and cheek bone, radiating to the shoulder. Two carbol-alcoholic injections of the sphenopalatine ganglion were followed by remarkable improvement, but one mild attack in three months.

Case 5 (File No. 63411). Aged 34 years. Was sent to me by her husband, a physician, for the relief of what he thought was major trigeminal neuralgia. In fact, both he and she were prepared for and expected me to perform the major operation. She had complained for 12 years of pain in the right side of the face radiating to the shoulder and back of neck. The

pain, which began deep in the cheek bone, was described as a steady, dull ache. There were tender points above the eye on the inner side of the nose, over the malar bone and condyle of the jaw where the pain was severe. Occasionally there was a dull ache in the eye. The pain generally was constant and dull, though of sufficient severity to seem to warrant hypodermic injections of morphin. It was not lancinating or paroxysmal and was not referred to the teeth, gums, lips or ala of the nose. She was given at intervals of five days two injections of the sphenopalatine ganglion. Three months later her physician wrote me: "The patient is in better health than she has been for six years; in these three months she has had only one comparatively light attack; she has gained in weight and altogether has made a wonderful improvement."

In another case, not unlike this, upon the application of cocain to the sphenopalatine ganglion there was immediate relief of the sense of pain and tenderness in the eye. To use the patient's words, she felt as though the tension in the eye had been relieved instantaneously as by the cutting of a taut string. Two alcoholic injections of the nasal ganglion were given, but without any substantial relief, up to the time the patient passed from my observation.

If time permitted I could cite numerous other examples of neuralgia of the face of obscure origin, quite atypical if compared with the picture of "major trigeminal neuralgia." But these examples will suffice to illustrate the points of distinction. In many there are attacks, but in the attacks the pain is continuous, not paroxysmal. In the majority pain is referred to the eye, or rather the orbit, to the temple and to the region of the malar bone, not, mind you, to the terminal distribution of the trigeminus as the teeth, tongue, lips and nose. There are in some associated headaches or hemicranias; the pain is not described as shooting, darting, lancinating, but as burning and boring, sometimes throbbing and often with a sense of tension or pressure in the tissues. Many of these patients are relieved in part at least by opium derivatives; some are drug addicts. One can find no apparent cause, either local infection or systemic disorder. In a number I have found that cocaineization of the sphenopalatine ganglion controls the pain almost immediately, but what the significance

of this may be I am at a loss to say, unless we acknowledge the sympathetic system as a factor. Certainly treatment directed to the trigeminal tract is of no avail.

I scarcely venture to enter upon a discussion of the rôle of the sympathetic system as a factor in the etiology of neuralgias. The subject is not a new one, to be sure, but interest in it has been revived by observations during the war, particularly as to the relief of the pain of causalgias by the Leriche operation—stripping of the periarterial plexus. In discussing pain of sympathetic origin in different regions of the body, Tinel (*La Medicine*, February, 1921) describes a case in which among other sensory disorders there was an intense burning sensation, paroxysmal in character, referred to the head, neck and shoulder. This burning pain, so characteristic of the causalgias, is quite common in the facial neuralgias that are not of trigeminal origin.

Not long ago I denuded the carotid artery of a patient from whom previously I had removed the Gasserian ganglion. Despite the fact that there was total anesthesia in the trigeminal zone the patient continued to suffer intensely from pain in the region of the mandible.

SUMMARY.

Following the persistence of pain after a Gasserectomy, the common and external carotid arteries were denuded of their plexus, but without any appreciable effect.

Case 6 (File No. 63906). Aged 30 years. Patient was admitted to the University Hospital November 10, 1917. Prior to admission the inferior dental nerve had been removed and an ineffectual attempt made to remove Meckel's ganglion. November 24, 1917, I excised the Gasserian ganglion. January 20, 1920, he returned complaining of as much pain as before, referred almost altogether to the region of the mandible. At the suggestion of Dr. Spiller, I excised the superficial cervical plexus, but to no avail. The patient was made the subject of an intensive study by Dr. A. H. Woods, who made the following notes: "There is a steady pain in the right lower alveolus, and paroxysms of electriclike pain, which shoot into the alveolus and angle of the mouth. These paroxysms may be started by apprehension of interference, by

scraping, rubbing, pinching or sticking the face or adjacent cervical areas, as well as by pressure over the right cervical sympathetic trunk. There has been recently a ciliospinal paralysis, with angioneurotic edema of lips and eyelids. Because of the latter phenomena, because of the tenderness over the trunk of the cervical sympathetic and because of the apparent existence of afferent fibers (paroxysms of pain being excited by rubbing, pinching or sticking the face), Dr. Woods proposed a denudation of the arterial plexus of the common and external carotid arteries. This operation was practiced but with no appreciable effect upon the pain."

Before passing on to the question of treatment, let me summarize briefly this rather discursive presentation of our observations upon types of neuralgia. We recognize, first of all, a definite clinical entity in what we prefer to call "major trigeminal neuralgia," the symptoms of which are so characteristic that a diagnosis can be made that should admit of no discussion. The etiology is still a matter of speculation. We recognize other neuralgias in the distribution of the trigeminal nerve, some of them simulating the major type, such as the neuralgias due to tumors involving the sensory root, the ganglion or its several divisions, or the neuralgia following herpes zoster. We recognize a third group of neuralgias, involving chiefly the ophthalmic division, that we believe to be of toxic origin; symptomatically they have nothing in common with the major type. We recognize a fourth or miscellaneous group in which the pain, though of great intensity but not paroxysmal, is referred chiefly to the orbit, temple and cheek, sometimes to the neck, associated frequently with general headache or hemicrania; a group in which our suspicion has been aroused as to the part the sympathetic system may play in its origin. We recognize, finally, a fifth group, which we classify with the psychoneuroses or psychalgias.

I have led the reader through this maze of miscellaneous pain phenomena and cited so many cases with a definite purpose: I wanted to leave in the mind of the reader a very definite impression, in the first place, that there are many forms of neuralgia, and in the second place that the picture of major trigeminal neuralgia is so sharp and distinct that it should not be confused with other forms. The diagnosis is

of vital importance when we come to consider the treatment, for what may be meat for one is poison for the other.

In discussing the treatment of major trigeminal neuralgia, I should like to restrict my remarks chiefly to my experience with the major operation. Of these there have been 204 avulsions or sections of the sensory root, 5 complete excisions of the ganglion and 5 partial excisions of the ganglion.

The major operation has long since been robbed of its terrors; the mortality, once 5 per cent, has been reduced to less than 1 per cent; there having been but one operative fatality in the last 177 cases of my series. One might say the method of its performance has been standardized. At one time or another I have introduced certain variations, to which I will refer in passing. For a while I substituted section of the root for avulsion, but to no advantage. In a few instances I have left intact the inner fasciculus of the sensory root, when the ophthalmic division was not involved, in the hope that by so doing trophic keratitis might be avoided. I am now waiting the results; should, in course of time, there be any recurrence in this series this modification will have to be abandoned. Latterly I have been able to conserve the motor root and thus prevent the atrophy of the temporal muscles which hitherto interfered with a perfect cosmetic result. This modification, furthermore, now makes it possible to operate on both sides in bilateral cases. All the technical difficulties have been mastered and the operation is now one of the most satisfactory the neurosurgeon is called upon to perform.

The vast majority of the patients, as one would anticipate, express complete satisfaction with the results. In fact, they are effusively grateful. There are, however, some exceptions to which I should like to call attention.

To a few the anesthesia is a source of annoyance. While the majority soon become accustomed to and disregard it, occasionally one sees the patient who, strangely enough, does not seem content with substitution of numbness for pain. One wonders sometimes whether in this case the pain before the operation was as violent as represented.

In a few instances the patients state that hearing is not as acute on the side of the operation. In every instance, when possible, I have insisted upon the patient consulting the otolo-

gist and, without exception, the report is received that hearing is as acute in one ear as the other. There is a subjective sensation of fullness in the auditory canal, such as we might have if the canal were tamponed with cotton. I have been at a loss to explain this "subjective" sense of deafness, nor has any explanation been offered by specialists whom I have consulted. This is a subject that is presented to you for discussion.

In a certain percentage of cases, about one in ten, there develop trophic lesions in the cornea. These usually appear on the second or third day, occasionally later, but in only three instances has the lesion not responded to treatment; and in two of these it has been necessary to keep the lids closed at their midpoint. In both instances the cornea is intact. Whether of advantage or not, we have adopted in our technic, preparatory to operation, a course of treatment for two days which includes installation of atropin and holocain. These with a boric acid wash and a protective shield are continued for a week after the operation. Any destructive lesion of the cornea may be prevented invariably if, upon the initial signs—i. e., the exfoliation of epithelium readily detected with a fluorescein stain, the lids are closed. Within 24 to 48 hours the corneal defect will be entirely repaired. We should not make light of this complication; while it is recognizably unavoidable in a certain percentage of cases, it is a gratification to know that if intelligently treated there will be immediate repair of the defect.

One of the most puzzling complications of the major operation is a transitory facial paralysis. Every surgeon who has operated upon any considerable number of cases has had his experience with this complication. My own includes altogether 7 cases; in the first 50 operations there were 3; in the second 50, 4, and in the last 121 there have been none. The paralyzes are always transitory and do not appear until the second or third day after the operation. They are peripheral, not central, in type. I am still at a loss to account for them. It so happened that since I discontinued the use of a self-retaining retractor which forcibly separated the margins of the wound this complication has not occurred. Hutchinson attributed it to the detachment of the dura mater from the

petrous bone, thus permitting blood to enter the small openings leading to the aqueductus Fallopii.

The surgical problems of major trigeminal neuralgia have been mastered. Granting no errors in diagnosis, satisfactory results are assured. Apart from our ignorance as to the etiology there is little left for the investigative mind, and our attention should now be directed to that miscellaneous group of atypical cases. Should a clear case be made out for a sphenopalatine ganglion type, permanent relief will come only when the ganglion is excised. Alcoholic injections, useful for diagnostic purposes, as a therapeutic measure are only of temporary expedience. My assistant, Dr. Grant, recently has elaborated a method of approach which, I believe, will render excision of the ganglion a simple, practical surgical problem. The part which the sphenopalatine ganglion plays in the etiology of these atypical forms cannot be definitely determined until the ganglion itself has been excised in a series of properly selected cases. In this problem and in the investigation of the rôle of the sympathetic system lies the most fertile field for future research.

XLVIII.

LARYNGEAL TUBERCULOSIS FROM THE POINT
OF VIEW OF THE PULMONARY SPECIALIST.*

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While I am not a laryngologist, my specialty is one which makes constant demands on the doctor for the use of laryngoscopy, and no lung specialist who uses the laryngoscope systematically can fail to have unusual opportunities to detect and study those earliest changes in the larynx in this disease, whose diagnostic value is so great, and to form very definite impressions as regards the diagnosis, prognosis and treatment of laryngeal tuberculosis.

It is unfortunately true that few doctors command an easy use of the laryngoscope, or are familiar with laryngoscopic diagnosis, any more than they are with the use of the ophthalmoscope, and while we lung specialists should be an exception to this rule, this is only true of us to a limited degree. When, eleven years ago, I read a paper on the early diagnosis of laryngeal tuberculosis, before the National Tuberculosis Association in Washington, many good men admitted privately to me afterwards that they never examined the larynx as a part of their examination of the patient, were not familiar with the laryngoscope, and when the case developed symptoms referred it to the laryngologist for a diagnosis. Even today, while conditions have bettered considerably, laryngoscopy is not universally used by such workers, and very rarely, if at all, by general practitioners. The result of this failure to recognize that the larynx is an essential part of the respiratory system which must be studied in every complete pulmonary examination, has been to delay disastrously the early diagnosis of this disease in very many cases, so that it is too often not found in those stages when it is most curable, but

*Read before the Southern Section of the American Laryngological, Rhinological and Otological Society, at Asheville, N. C., January 29, 1921.

only discovered when pronounced symptoms, such as hoarseness, dysphagia, aphonia, etc., force it upon the doctor's attention. When these symptoms appear the case is sent to the laryngologist, who too often finds it so far advanced as to offer little prospect of successful treatment, and hence not only does the patient lose precious time, and too often all opportunity for a cure, but the laryngologist, unless he works in a pulmonary health resort, and hence has a chance to see this disease early, forms an unduly pessimistic view as to its curability, and thus fails to take an active interest in its treatment, for a man must be hopeful of his results if his therapeutics are to be successful.

Indeed, the laryngologist, unless he lives in a health resort, and thus has ample opportunity for seeing tuberculous cases, rarely I believe has a chance to see really incipient cases of laryngeal tuberculosis, owing to the fact that early trouble does not produce notable symptoms, such as would lead a layman to consult a throat specialist of his own accord, and also to the fault of the doctors who refer their throat cases to the throat specialist too late. A careful study of the treatment of laryngeal tuberculosis in the various handbooks on the subject shows that in the large majority the illustrations given and the descriptions written of the disease are not of its really early forms. The majority of the cases pictured are so hopelessly advanced that I feel indeed sorry for the man who has to treat them. There are some books which are notable exceptions to this rule, but they are distinctly in the minority, but I am glad to say that one of the best is by an American. I refer to the work by Lockard of Denver, which does credit both to its author and to our country.

If the use of the laryngoscope were more general, the early changes which are found in so large a number of pulmonary cases, and which with experience are not difficult to recognize, could be easily found. Various observers have reported different percentages of incidence of laryngeal tuberculosis in the course of pulmonary trouble, the rate varying from 13.8 as given by Wiligk up to 97 per cent according to Shaffer, Kidd in Albutt's system considering 50 per cent a fair average, Schech giving 30. I have not had time to look up my records for the past and to give you my statistics, but I

am very sure that 30 per cent is if anything rather an under-
than an overestimate.

The conscientious laryngologist does not fail to use his stethoscope as an aid in the diagnosis of many doubtful cases, even if the more careless worker, as we all know, too often does not, and in this way I yearly see numbers of cases of pulmonary tuberculosis which have been discovered by throat men and sent to the pulmonary specialist, and I feel equally that the lung specialist should always use the laryngoscope to confirm his diagnosis of pulmonary trouble, and then send the cases to the throat specialist for treatment. I have already referred to the fact that a large percentage of cases with beginning trouble in the larynx show no symptoms, or such slight ones as not to draw the patient's attention, or indeed the doctor's, so that without an inspection the involvement of the larynx would not be suspected. If the doctor has to send all his cases to the laryngologist for an opinion, many throats will not be examined at all, whereas if he looks at them himself, none will escape inspection, and moreover the effect on a man's mind of seeing a thing with his own eyes is much stronger than when the findings are reported to him by another man. Some may urge that the recognition of early lesions is beyond the power of any but the throat specialist, but I cannot admit this, and I believe that any lung specialist, who examines the larynx in every case, will in one or two years get a very wide experience in early laryngeal lesions, probably a wider one than the throat specialist can hope for, since naturally the number of cases of really incipient laryngeal trouble that come of themselves to the latter must be small.

Many men I believe hold off from using the laryngoscope because they think it will be too difficult to learn or that it will be too much trouble, but a few lessons in the technic, followed by an honest inspection of the throat of every case, will, I am sure, in six weeks or less, give the doctor an easy command of this beautiful and simple diagnostic instrument, and when that command is acquired it is only a question of time, intelligence, opportunity and close observation before he will become thoroughly familiar with the changes which suggest tuberculosis in the larynx.

I would now review my experience as to the early changes in the larynx in this disease, and I would first say that in the absence of a careful examination of the lungs, revealing to us tuberculous involvement, many of these changes in themselves are not absolutely diagnostic, whereas when the lungs have been studied and their condition is known, the diagnostic value of certain changes is enormously increased. Further it is well to remember that pachydermia, catarrh, syphilis and some other conditions can very closely simulate tuberculosis, and that therefore to think that the diagnosis of tuberculosis is always easy would lead one into great error. Here it might be apposite to quote that great authority on laryngeal matters, Schnitzler of Vienna, who has said very wisely: "With knowledge grows doubt." Of this view of Goethe's I am often unconsciously reminded when I compare my present doubt in the diagnosis of difficult cases with the confidence with which I thought I could unravel the most complicated findings. However, I do not believe any careful worker would allow himself to diagnose tuberculosis purely from a laryngoscopic inspection without searching carefully elsewhere in the body for corroboration by the discovery there of other tuberculous changes. Of course, some of the situations that meet us are very difficult, especially the combination of syphilis and tuberculosis in the same ulcer, and again the combination of tuberculosis and cancer, and the differentiation of some syphilitic from some tuberculous ulcers, but these difficult situations are not for me to discuss in this place, nor do they occur in cases where the question of extremely early diagnosis comes up.

Coming to the changes which we are studying, I would say that the departures from the normal which are of value to us can be classified as catarrhal, infiltrative, ulcerative and tumor-forming, edema not being in itself strictly diagnostic. Formerly much stress was laid on the value of changes in color of the mucous membrane, and a great deal of stress has been laid on the importance of the discovery of pallor of the mucous membrane, either of the soft palate or of the larynx proper. This view has been supported by so many excellent men in the past that one does not like to contradict it too strongly, but I am glad to say that in recent years many writ-

ers have combated it, and it is now generally recognized that while pallor is often found in the mucous membranes in laryngeal tuberculosis, it is not a reliable diagnostic feature, as a similar pallor can often be found in cases of marked general anemia and in prostrating and exhausting conditions. When, however, it is found in conjunction with other suspicious signs, it has, of course, some value. J. Solis Cohen of Philadelphia has, in speaking of the color changes in the larynx, stated very correctly that acute processes are generally ushered in by congestion, chronic ones by pallor.

As to catarrhal conditions, they are not in themselves diagnostic of tubercle, and unfortunately nontuberculous catarrh can imitate almost any of the conditions produced by a tuberculous catarrh, and this fact must be kept ever before us. A number of tuberculous patients show a generalized laryngeal catarrh, and such a general catarrh very frequently precedes the outbreak of definite tuberculous trouble, but no wise man would base a diagnosis on this. When, however, the catarrh is unilateral, patchy and persistent on one part of one cord, while the other side is normal (Figs. 2 and 3), it has great diagnostic significance and is not likely to be found in any condition but tuberculosis. There is one form of change which is common both to catarrh and to the development of tuberculosis which I have found to be of great value and to which I have elsewhere referred. I mean the grayish wrinkling and thickening of the mucous membrane of the posterior commissure (Fig. 1) found in a large number of tuberculous cases. While like other catarrhal manifestations, one cannot claim it to be diagnostic, it is yet suspicious, and if it is watched carefully, as it should be when found, it will be discovered in the tuberculous to be an early step in the development of more definite laryngeal manifestations.

A majority, however, of the diagnostic changes will come under the head of infiltration, and I think we will all agree that the commonest site of the infiltration is in the posterior commissure, more usually central, but also to one side or the other. The tablelike elevation of the posterior commissure centrally located (Figs. 2 and 3), I believe to be a very reliable early finding (though this, too, can be imitated by catarrhal change), and in this view I am entirely in accord with Schnitz-

ler (*Klinischer Atlas der Laryngologie*, Vienna, 95). These elevations, if central, usually show a groove down their centers (Fig. 2) which can disappear if they thicken and enlarge. The mucous membrane is generally a pale, grayish pink, but at times it may be uniformly gray and wrinkled, and again at other times it may be reddened and angry. While, as I have said, this condition can be produced by catarrh, the longer I study the larynx in tuberculosis the more I am satisfied that such an elevation in this region is extremely diagnostic of the presence of laryngeal tuberculosis. The further course of such an elevation varies. Sometimes its center breaks down into a typical ulcer, which may stay localized, or may reach up on to the upper surface of the arytenoid region, or spread forward on to the insertion of the cord, on one or both sides (Figs. 7 and 8). Quite frequently this ulcer develops abundant granulations on its base (Fig. 5). At times, instead of abundant ones, it will throw out a hornlike, pointed one in the center (Fig. 6). At times the mass does not break down but enlarges somewhat, organizes slowly, and finally forms a firm, resistant, fibrous mass, which, if it had not been watched from its beginning, one would take for a tuberculoma (Figs. 10 and 12). Again, under treatment, it may gradually shrink and almost, but rarely totally, disappear, leaving a larynx that seems normal.

When the thickening is not central but eccentric, it is apt to involve the posterior insertion of the true cord, and thicken the posterior end of the cord at the same time (Fig. 3). Casselberry of Chicago, one of our best American students of laryngeal tuberculosis, considered a small grayish white, triangular ulcer or fissure at the insertion of the posterior cord, and in the center of this infiltration (Fig. 4), the best early diagnostic sign of tubercle which he knew, and it is unquestionably a very reliable sign, though I am inclined to believe that the tablelike elevation of which I have spoken is more frequently seen.

I might here quote part of a letter written to me by Dr. Casselberry on March 28, 1911, which well expresses his views as regards the earliest changes in the larynx in laryngeal tuberculosis:

"I lay the greater stress upon a lateral hyperplasia or infil-

tration which commences in the vicinity of the vocal process and as it progresses forms first a crease and later a fissure towards one side in the interarytenoid fold. I agree that central hyperplasia is a more common lesion, but do not consider that much reliance is to be placed upon it alone as a sign of tuberculosis, as it occurs in all sorts of inflammation of the larynx. That is, a nontuberculous central infiltration may be confusingly similar to that of tuberculous origin, whereas a lateral lesion, although less frequent, is in my experience quite characteristic of tuberculosis. This slight difference in the impressions gained by us is due, I think, to the variation in the run of patients coming before each. With you the tuberculous predominate, yielding of course a larger proportion of tuberculous central infiltration, while with myself the nontuberculous predominate, serving to exhibit in my mirror many central infiltrations which obviously are not tuberculous, but which, should the patient happen to be pale and thin, and so forth, the central infiltration would be indistinguishable from that of tuberculous origin."

It gives me great pleasure to thus give credit to my friend Dr. Casselberry, than whom there was no more careful student of these conditions, and to put on record his valuable views in this matter.

The infiltration of the posterior end of one or both cords is also of very great value (Fig. 1). The processus vocalis is enlarged, the whole posterior portion of the cord reddened and thickened, and if it is bilateral, as is frequently the case, the intervening mucous membrane is wrinkled and red, sometimes, however, gray. However, the inexperienced must be careful not to mistake the changes in pachydermia for the condition of which I speak. Here on the one side you have a prominent processus, on the other side a pit in the cord from the pressure of this prominence. Thickening, enlargement, and reddening of an arytenoid, on one side or the other, at once excites our suspicion (Figs. 11 and 6). The antero-posterior diameter of the central arytenoid region is increased, and the cartilages of Santorini and Wrisberg are one or both greatly thickened and rounded, the mucous membrane over them usually being reddened.

I have not found infiltrations or ulcerations of the aryepi-

glottic fold very early, but a reddened infiltration of the true cord localized (Fig. 11) and not involving the whole cord, as in the typical spindle shaped cord (Fig. 5), but of only a small portion of it (Fig. 1), is not, I believe, caused by anything but tubercle. While spindle shaped swellings of the cord are not as early as more localized thickenings, they are, of course, of great diagnostic value, though even here there are other conditions which can produce such swellings that cannot be told from tuberculous ones. Infiltrations of the false cord, of one side or the other, or of both (Figs. 12 and 6), have very great value, and where I find in an otherwise normal larynx an infiltrated and thickened cord on one side, not totally hiding the true cord, but encroaching upon its normal width in some portion of its course (Fig. 6), I am rarely disappointed later in finding the change to be of tuberculous origin. It is rarely, in early cases, that both true cords are hidden from sight, as they are by later thickenings of the false cords, but unlike many tuberculous changes in the larynx, you may find both false cords thickened at the same time, one, however, generally to a greater extent than the other (Fig. 12). In my experience, owing to pressure conditions, I believe, the mucous membrane of the upper surfaces of the infiltrated false cord tends to become yellowish pink, and it is at these sites that later serpiginous ulcers may develop (Fig. 6). At times the infiltration of the false cord may be very massive (Fig. 12), the enlargement being vertical as well as horizontal, and, like all changes of the false cord, very productive of at least hoarseness and often of aphonia.

The epiglottis is not, in my experience, quite so common a site of early changes as the regions already referred to, and I believe that small thickenings of the edge (Figs. 2 and 3) are more common and more early than the well known thickenings of the center of the posterior surface (Fig. 9). These small swellings of the edge are usually red and angry in their centers and pale towards their borders, and tend quite early to break down into ulcers which are very intractable (Fig. 8).

The early ulcerations of the larynx show themselves first either on the center of the posterior commissure (Fig. 8) or at the insertion of the posterior end of a cord (Fig. 4) or localized on a small area of the free edge of the cord (Fig.

9). The typical mouselike eating out of the edge of one cord (Fig. 6), which I believe to be always caused by tuberculosis, appears somewhat later. When we consider the pathologic condition of the tissues in tuberculosis of the larynx, it is evident that real tuberculous ulcerations follow infiltrations and are therefore not as early as are these, but they often appear very soon, and if treated with lactic acid or formaldehyde glycerin, my preference being for the former, the results are admirable. True, many good authorities claim that many of the ulcers in the larynx are not strictly tuberculous, but are simply erosions of the mucous membrane occurring in the larynx of a tuberculous subject, whereas the real tuberculous ulcer occurs from the breaking down of a tuberculous infiltration. Lenox-Browne quotes Heinze, who is pathologic examinations of forty-nine apparently tuberculous larynxes found 83 per cent tuberculous, 17 per cent nontuberculous. The demonstration of bacilli on their surface proves nothing, since they may have been deposited there from the sputum, and only by cutting out a portion of the ulcer and studying it microscopically could it be determined that it was or was not tuberculous in nature, and in America this is not a procedure we are likely to follow, but I am inclined to think it wise to regard and treat all ulcerations in a tuberculous larynx as tuberculous, even if it may give us a rather unduly favorable view of their curability. However, even when the ulcer shows the undermined ragged edges and the grayish deposits on its base of a typical tuberculous ulcer (Fig. 7), so that there can be no doubt about its tuberculous nature, it can still yield splendid results to local treatment. The earliest ulcers are those I have referred to as spoken of by Casselberry, small angular ones, tending to become fissures at the posterior insertion of the cord (Fig. 4). From the bases of tuberculous ulcers may arise either large rounded masses (Fig. 10), pointed pyramidal masses (Fig. 12), or many pointed granulations (Fig. 5), in the posterior commissure, and while these, of course, are not extremely early changes, they are yet so diagnostic and striking as to have great value to the physician. When they are present there seems to be a favorable fibroid tendency, so that while they do not disappear they tend to organize, shrinking somewhat and becoming firm and hard, and can remain for a

long time with no bad effects except that when they are situated, as they are apt to be, on the posterior commissure, they can produce very persistent hoarseness. However, with patience and care I have seen them slowly shrink until they almost disappeared, leaving a result, both as to appearance and as to voice, that one could not have believed possible. However, this organization occurs chiefly in the rounded and pointed forms, and not in those with numerous pointed granulations, which are more apt to break down, undermine and spread (Fig. 9).

The ulcers which form on the upper surface of the false cord are sometimes typical, undermined, ragged and serpiginous, but are more apt to be like superficial erosions, but neither kind is very amenable to treatment (Fig. 6). Ulceration of the epiglottis is an extremely trying lesion because, while it can come early, it tends to spread rapidly, causes great dysphagia, and is very rebellious to treatment. Our presiding officer has gotten for me such admirable results in certain of these cases by epiglottidectomy that I do not think it worth while to treat them, if at all extensive, by other measures, and would advise their amputation as soon as possible. The results are often unbelievably brilliant.

Ulcerations of the free edge of the cord, if the patient preserves absolute silence, can give us very good results at times, but ulcerations spreading out onto the cord from an ulcerated posterior commissure (Fig. 7) and forming the well known horseshoe shape form of ulcer are of very bad prognostic significance.

Tumor formations, with one exception, are not early. The one I refer to is a small, long, pointed tumor, subglottic in origin, and appearing from underneath the anterior commissure, protruding like a small nipple (Fig. 9). It is usually slow in growth, and in my experience, rather favorable in its results, though at times it produces troublesome hoarseness. All the other changes with which the books are filled, the turbaned epiglottis, the edematous arytenoid, the extensive, dirty, spreading ulcerations, the perichondritis, etc., etc., have nothing to do with the subject of the early changes of the larynx in this trouble, and as doctors become more careful and thorough in their examinations of their cases, I believe that cases

of tuberculosis of the larynx are going to come to you gentlemen in future so much earlier that you will see less and less of these unfavorable and ill omened conditions, which are responsible for the very bad repute which this disease has with the profession generally.

It is to be noted that the cases I have seen have almost all of them been known to me to have tuberculosis in their lungs before I have seen their throats, and therefore I can feel much more certain of my position than can the man who chances in a routine laryngeal examination to find some of these changes in persons who seem otherwise perfectly healthy, but a careful examination of the lungs is always at his disposal, and when any of the conditions that I have spoken of are found in the larynx, he would certainly be hopelessly derelict in his duty to his patient unless such an examination was made. By themselves, as I have said, they will not allow the doctor to be too positive and sure in his diagnosis, but, combined with the findings in the lungs, one can afford to make a positive statement. It is astonishing at times to see how even good men will fail to go into the history and condition of a patient thoroughly and thus not recognize the tuberculous nature of conditions in the throats which come to them.

Within the week I have seen an instructive case of this nature. A young man, before he went into the war in 1917, had a rather troublesome cough for some weeks, and while his health in the army in this country and in Europe was good, the cough persisted most of the time. He came out of the army in 1919, feeling well, but still with some cough and hoarseness. He went to a prominent laryngologist in a great city, whose name I am sure is familiar to all of you. He examined him, said that he needed a tonsillectomy, the tonsils were removed, the cough continued, he treated the nose locally in various ways, and had the patient under observation for a year. The patient fearing tuberculosis, suggested this possibility to the doctor, who pooh-poohed it, saying that he looked too perfectly well for such a thing to be possible, and did not examine his sputum or his lungs—this, mind you, being a man of standing and prominence in the profession. Later he had the good fortune to be recommended to another equally well known man who at once suspected trouble, examined his

sputum and put him on systematic laryngeal treatment and sent him to a lung specialist, who found trouble. Both lungs are considerably involved, and the larynx shows changes which in themselves are not typical, but which combined with the findings in the lungs are sufficient to diagnose the laryngeal involvement as tuberculous. When physicians can make mistakes of this sort, for this is not an isolated case, through a foolish cocksureness, and a failure to examine the sputum and the lungs in cases that are coughing, it is no wonder that we often see bad results. Yet many men seem to think that dysphagia must be found before they can think of the possibility of tuberculosis. It simply serves to remind us that in medicine nothing can be taken for granted and that no opinion is justified that is not backed up by a complete and conscientious examination.

A difficulty under which the laryngologist labors is that he cannot usually have his patients as closely under his eye and their lives as strictly supervised as can the lung specialist, and that thus the patient usually misses the favorable conditions yielded by sanatorium treatment and outdoor life. If, however, the cases are seen by him sufficiently early and he can arrange to get for them proper conditions of living, I believe that the general view as regards the very bad prognosis of laryngeal tuberculosis would undergo a great change and become much less pessimistic. It is not usually advisable for a lung specialist to undertake the treatment of such cases himself. He is not technically prepared to carry out the many valuable therapeutic instrumental procedures which may be necessary, and the laryngologist can well say to him: "Shoemaker, stick to your last." But I do believe that in uncomplicated cases of infiltrative tuberculosis of the larynx he can, by strict rest of the voice through silence and by carrying out what Bosworth has called the mild treatment of these cases, get very excellent results. Indeed, very active local treatment in the beginning is usually contraindicated. The mild treatment, as I have used it, consists first of local cleanliness through the use of simple alkalin sprays; second, where congestion is a feature of the trouble, the use of mild astringent sprays; third, where stimulation and healing are necessary, the use of oily sprays in which menthol, eucalyptus and

gaultheria are usually elements. Catarrhal conditions, in my experience, whether tuberculous or simple, yield admirably to this very simple treatment. When, however, we find infiltration as in the changes I have described earlier, the addition to the former treatment of the insufflation of powdered iodoform will, I am satisfied, as a result of ample experience, cause in a very large number the gradual reabsorption of such infiltrations and the cure of the trouble, even if so good an authority as Lockard disbelieves in the practice. I have not found it difficult to teach the patients how to insufflate their own larynxes on wakening and on going to bed, although there are certain people with an idiosyncrasy to iodoform, in which it acts as an irritant, or whom it nauseates, and where it has to be given up. It sometimes causes a slight cough for a little while, but this is not troublesome. As to the patient's ability to blow the powder into the larynx, we all know that they succeed with orthoform, thus frequently checking severe pain, and where orthoform can go iodoform will go also. The mode of its action is simple and plain. Iodoform in the presence of living cells gives off nascent iodine, which is far more active than ordinary iodine, and than which there is no better tuberculocide known. This iodine is discharged into the infiltrated tissue and slowly causes its absorption and disappearance. I have used it for too many years (twenty-five) and in too many cases to doubt the causative relation of the disappearance of the infiltration and the use of the iodoform, or to justify the claim that it is merely a coincidence, and I can heartily recommend it to all of you. If one doubts the patient's ability to apply it correctly (naturally, the patient must be trained how to insufflate correctly while he inhales and how to put the point of the insufflator in the correct position), the patient should come in daily, but I personally think it very unwise to make a tuberculous patient come daily to the doctor's office for a treatment.

In ulcerated cases it is by no means so useful, and in any case, in these local applications are far better. Unless the lung specialist is especially skillful in the use of the laryngeal applicator, patients with ulcers had best be sent to the laryngologist for local treatment, and in these early ulcers the use

of lactic acid glycerin or formaldehyde glycerin produces very brilliant results.

So essential to the laryngologist's success with these patients is the condition of the general vitality that it would be wise, if he cannot watch this feature of the case, to have all his tuberculous larynx cases watched by a man skilled in the regulation of their lives, the raising of their vitality, and the bracing up of their morale, and I am sure in this way very much better results would be gotten than by local treatment, not re-inforced by constitutional and moral.

May I here be permitted a few words as to some of the results of laryngeal surgery, which I, seeing the cases after the laryngologist has gotten through with them, have a better opportunity to watch than you gentlemen. I refer to the not infrequent cases of the waking up of a hitherto entirely latent tuberculosis through a tonsillectomy or through some laryngeal operation. I have not rarely seen such interference the starting point of a desperate and fatal pharyngeal or laryngeal tuberculosis, or, much more frequently, the beginning of an active pulmonary tuberculous involvement, doubtless through the trauma of the operation disseminating tuberculous matter which had been hidden in the tonsils or other tissues. For this reason I believe that it is very important if the snare is used that the tonsil be very well freed before the wire is applied so that the pressure can by no means disseminate infective matter when the loop is tightened, and to do all such operations as cleanly and gently as possible.

Again, I see not a few cases of tuberculosis whose history shows that the beginning was due to the anesthetic used for a tonsillar or other operation. I will not here upon up the to me intensely interesting question of posttonsillectomy pulmonary abscess, a subject first referred to in this country. I believe, by Richardson of Washington in 1910 and 1912, for, though I see a number of such cases every year, it would divert discussion from the main subject of my paper.

In the years I have been treating tuberculosis I have seen so many cases where a history of an anesthesia by ether in a hitherto healthy person, followed by the development of a cough and then of tuberculosis, is plainly given, that I feel,

despite the fact that the great majority of patients who take ether for these purposes escape with no bad results, that this question of the possible danger of etherization as an initiator of tuberculosis must be seriously considered before every operation. Many operators would laugh at this, as they usually do not see these cases after the wound is healed and when the new trouble begins, and it is the lung specialist, to whom they come somewhat later, who has a chance to study them. I fully realize the comfort to the operator of a deeply anesthetized patient, which makes his operative technic so much more easy and exact, but the gain in these ways is more than counterbalanced when we realize that that sleeping tuberculous focus which all of us carry may be and often is wakened into activity by the irritation of the anesthetic in the lungs.

Moreover, I believe, it has been sufficiently demonstrated that with the use of novocain and adrenalin a beautiful and satisfactory anesthesia can be produced in the larynx, pharynx or tonsils, and that, save in children who are so terrified that they cannot be kept quiet, it should be the anesthetic of election in all laryngologic work.

Finally, since tuberculosis so often affects the larynx, your specialty and mine are bound to be closely united, and it is most desirable that the men working in both these branches of our profession should seek to see these problems through the eyes of the other specialty and not purely in the light of their own. The lung specialist needs to command thoroughly the use of the laryngoscope and have a comprehension of the changes in early laryngeal tuberculosis. The laryngologist needs to be a careful examiner of chests and to understand the control of the patient's life and the building up of his general constitution. The former should be carefully on the lookout for laryngeal changes and symptoms in his patients and promptly call to his aid the laryngologist when he finds those slight departures from normal which are either positively diagnostic or at least strongly suspicious. The laryngologist needs, I believe, to consider the condition of the lungs of all his patients, especially those who cough, and examine them thoroughly much more often than he now does, or at least he must be able to take a good general history and to recognize the symptoms and signs which point to possible

tuberculosis and then to refer the case to a competent man for examination, and he should give up the very prevalent custom of treating coughs as though they were purely of local laryngeal origin. When he does this he will find that in a large number of cases the real origin of the cough is in the lungs. To treat a cough locally unless you know the lungs are normal is in these days simple malpractice. When we look at cases in this light, not only will our two branches of the profession benefit, but what is far more important, our patients will get far better results from our treatment.

Let us hope then that our two specialties will yearly come closer together, work more in unison, comprehend better the problems which each has to face, and come together to help each other solve them. When this is done we will see fewer mistakes in diagnosis, less careless and planless treatment, and we will look with less pessimism than has hitherto been our custom on the results of the treatment of laryngeal tuberculosis.

61 NORTH FRENCH BROAD AVE.

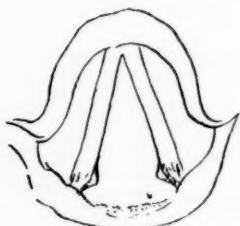


Fig. 1.

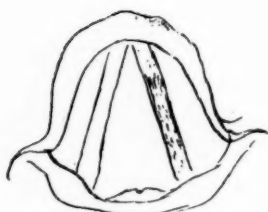


Fig. 2.

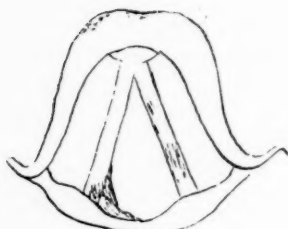


Fig. 3.

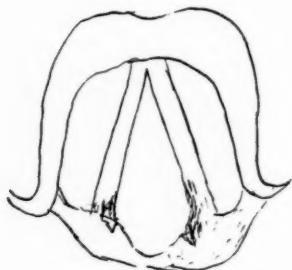


Fig. 4.

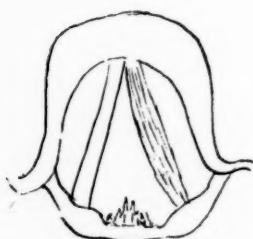


Fig. 5.

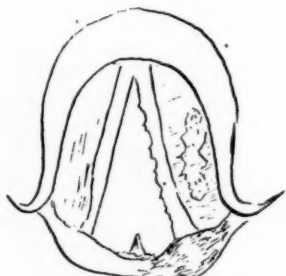


Fig. 6.

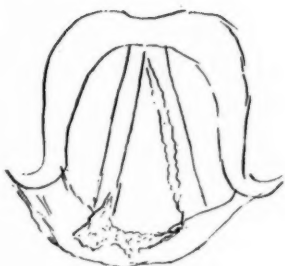


Fig. 7.

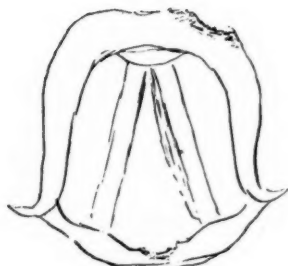


Fig. 8.



Fig. 9.

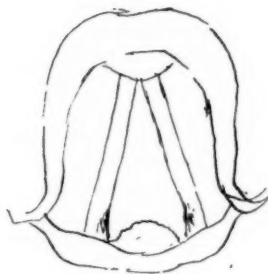


Fig. 10.

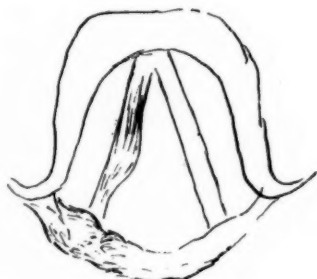


Fig. 11.

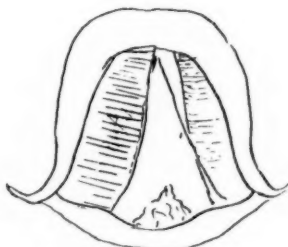


Fig. 12.

XLIX.

CLIMATE IN THE TREATMENT OF LARYNGEAL
TUBERCULOSIS.*

BY CARROLL E. EDSON, A. M., M. D.,
DENVER.

Tuberculosis of the larynx is practically always secondary to an active pulmonary tuberculosis. The extent and character of the primary lesion usually determine our choice of climate for the patient.

To discuss satisfactorily how the supervention of the laryngeal infection may modify this selection, we must have a clear understanding of the part climate plays in the cure of pulmonary tuberculosis. We must know just what reaction we expect to obtain when we recommend a change of climate.

The arrest of a pulmonary tuberculosis is brought about through tissue and physiologic resistance to the tubercle bacillus and its products. At present our only means of cure are those which directly or indirectly perfect, maintain or increase this resistance. The essential factors to this end are:

1. Outdoor life in pure air and sunshine,
2. Abundant nutrition,
3. Rest.

An outdoor life means living constantly in the open air. Its effectiveness is directly in proportion to the number of hours so spent out of every twenty-four. Its benefits are not secured by the patient going out occasionally for recreation, but only by passing his entire life, so far as possible, in fresh, open air; not only while at work or play but while at rest, and especially during the hours of sleep.

Abundant nutrition means, not an amount of food eaten or even of fat accumulated, but the highest maintainable balance of nutrition. It is not food ingested which counts, but food made physiologically active. To secure this maximum requires careful attention to all the patient's metabolic pro-

*Read by invitation before the American Laryngological Association, Atlantic City, May 30, 1921.

cesses of digestion, assimilation and especially of elimination through bowels, kidneys and skin.

Rest is economy of physiologic expenditure. Its importance in tuberculosis cannot be overestimated, but it must be carefully controlled. It is a relative term, and its meaning will vary according to the individual patient, from absolute confinement to bed over long periods, to such graded and controlled exercise as may approach full measure of work. It includes not only the limitation of muscular exercise, but control and regulation of the intellectual and emotional activity of the patient.

While all these factors are important, it does not follow that there is equal need of each for every patient. One will be most helped by rest, his nutritional balance being already well established; while another stands in urgent need of food, or may be wholly untrained to hygienic living, or the uses of fresh air. For this reason close and prolonged medical oversight is essential to secure the patient's gaining the maximum benefit from and proper distribution of the factors of rest, food and outdoor life.

What help do we gain from climate in this scheme of living?

Climate is the sum total of the meteorologic conditions prevailing in a given region over considerable periods of time. It is the average mean and range of meteorologic phenomena characterizing that place. Weather is the immediate state of those phenomena at any particular time. It is important to have this distinction always in mind. Their confusion has caused disappointment to patients and resentment against the climatologist. The weather may be very bad, wet and cold, for instance, at any one time, although the average usual conditions in that place at any time of the year are warm and sunny days. Equally a region of general cloudy or damp climate will have its pleasant days of bright sunshine.

Climate being the whole average state of meteorologic conditions prevailing in any region, every patient, wherever he dwells, lives in a climate of some kind. It is incorrect to speak of the climatic treatment of tuberculosis as one would of the quinin treatment of malaria, as if it were a specific. It is equally absurd to contrast it with medication by tuberculins or confinement in a sanatorium, as if it were a means

which could be used or not, according to choice or prejudice. The climate has to be considered in every case. It cannot be avoided, for it is the environment of temperature, sunshine, humidity, rainfall, wind and barometric pressure in which the patient lives. If we keep him at home we select a climate for him as fully as if we sent him away.

The application of climate to the cure of pulmonary tuberculosis is therefore only the best utilization of these average conditions to aid in securing the fullest measure of the necessary outdoor life, in bringing some of the meteorologic components to the support or upbuilding of nutrition and tissue resistance to the disease or in maintaining physiologic rest.

A continuous outdoor life being of first importance for his cure, it follows logically that there must be an advantage to a patient with pulmonary tuberculosis in placing him promptly in a region where he can most constantly, most comfortably, with the least difficulty and fewest interruptions lead such a life.

The process of healing in a tubercular lesion is slow, and the establishment of complete arrest requires a period measured, not by days, but by months or years, during which time the patient should live out of doors. It is not the occasional pleasant day, accordingly, which counts, but the probability of such days prevailing abundantly over long periods.

Theoretically a patient can be kept out of doors in any weather, and pure air is the same everywhere; but in the actual management of a patient's life it is not the academically possible, but the easily practical, which counts the most.

The character of the weather from day to day has a great influence upon the ease and safety with which an invalid can spend his time out of doors, and the readiness with which he submits to the outdoor regime.

In one region the winter temperature of the air, for instance, may range so low as to require so much clothing as to be a burden to a weakened or delicate patient. It may fall so low at night as to forbid his sleeping out at all, thus depriving him of one-third of his outdoor life. In another place the summer temperature will be so high or accompanied by such humidity as to be seriously oppressive, diminishing the appetite or preventing such exercise as is desirable. A change

from such a climate to a cool and breezy one will obviously be of advantage to the patient.

The degree of actual and relative humidity affects our sensation of temperature and our endurance of heat or cold. It directly influences heat loss and consequently is a factor in the metabolic balance.

The amount of sunshine, the percentage of the total possible which is actually realized in any place is of great importance to an invalid, especially if he must be inactive during the cold of winter days. In one region there may be in winter out of a hundred consecutive days an average of only twenty which are clear, while in another during the same period less than twenty will be cloudy.

Whether he be at rest or active, it is not so easy for a patient to live out of doors, even if the air be equally pure, in a place where fog or drizzly rain is frequent, as it is where week after week goes by without rain or cloud.

Similar comparative illustrations might be given of other climatic factors which are of physiologic importance to a person planning to live a long continued outdoor life; the frequency and force of high winds, influencing heat loss in cold weather or causing nervous wear if hot and dry; the regularity and extent of the diurnal range of temperature or the frequency and degree of variations from the mean.

But these examples are sufficient to indicate how the physician who is mapping the plan of life for a pulmonary invalid should consider whether he can better the conditions under which the patient is to make his fight by sending him to a more salubrious region just as he would move another patient from a dark, unventilated closet in a tenement alley to an open air ward in a municipal hospital. We improve the surroundings to the extent of our ability and the patient's means. We strive to place each patient where the climatic conditions most facilitate his leading the proper outdoor life.

If such favorable conditions are found to a greater degree or in a more constant measure in another region than the patient's home we advise him to go to that place to live; we urge him to make a change of climate. He moves into better meteorologic surroundings, as he might from a damp, poorly heated house to a dry and sunny one.

A change of climate for the purpose of facilitating an outdoor life should be prescribed, however, only when it can be made without more than counterbalancing loss in the other factors of the cure: nutrition, rest and medical control. There is no gain to a patient in placing him in the most ideal climate if to do so deprives him of the means of securing sufficient proper food or the other conditions of right living. A patient who at home might have abundance of food and care, and, even if idle, continue to have it through family assistance, may not away from home be able to command that aid in the form of money. To earn this by his own exertion may demand labor at a time when work or activity is most detrimental. Either nutrition or rest must suffer. Such a patient is better off at rest amid such conditions of outdoor life as his home climate affords.

On the other hand, one whose physical state warrants labor or whose social and financial circumstances force him to work, may often find that the gain from a more equable, milder or more bracing climate will enable him to continue at his occupation as he could not under the old less favorable conditions. If his only days for outdoor rest are his Sundays, he will benefit from living in a region where he can sleep out the entire year, and where forty of his weekly holidays are likely to be pleasant and sunny, instead of in a place where at most he might count on fifteen or twenty without rain or cloud.

Closely related to the question of nutrition and rest is that of proper medical supervision of the patient's life. The exceedingly elastic meaning which we must give to the term "rest" necessitates such competent medical control of the patient wherever he may live. This is especially true of cases with complications, such as laryngeal involvement, for instance, which may need local treatment. In determining upon a change of climate it is important, therefore, to know whether in the new region of better outdoor facilities the patient can have a sufficient degree of skilled medical advice. It is equally important to impress upon his mind the need for such control in the new abode. Patients too often act as if they had been told that the change to a different climate constituted the whole cure. It only affords a better opportunity to work out that cure.

Finally certain physiologic reactions to climatic factors must be borne in mind. The problem of nutrition, as we know, goes deeper than the mere question of food supply. So a change of climate may, by reason of altered conditions of temperature or sunshine, prove beneficial to one patient by stimulating appetite, digestion and assimilation. It may be unavailing to another because some factor, it may be of barometric pressure or humidity, makes demands upon his circulation or emunctories beyond their power of response. This so disturbs the physiologic balance as to offset the other advantages of easier outdoor life.

As I am now asking your attention only to the general principles controlling the selection of climate for the pulmonary invalid, it is unnecessary to go into a detailed discussion of these varied physiologic reactions. I state very briefly only those meteorologic factors of climate which experience has shown to directly influence and be most conducive to improvement in pulmonary tuberculosis.

1. Moderate or fairly high altitude. Such elevation, besides giving greater diathermance to the air and stronger sunshine, has a direct effect on hemopoiesis, promptly and decidedly increasing the formation of red corpuscles.

2. Temperature.—Cool climates are definitely conducive to nutritional improvement. Almost without exception patients make their best gain during the cold months. In southern latitudes elevation aids in securing this cooler climate.

A moderate daily range of temperature is desirable, as is a reasonably well marked annual range. Both give variety and stimulate circulatory action. Sudden, violent or long continued variations from the mean are to be avoided, as they tax the patient's physiologic response and may interrupt the routine of his outdoor life.

3. Sunshine.—The value and results obtainable from heliotherapy have been most astoundingly shown by Rollier in his clinic. The more abundant and continuous the sunshine, the better available is this valuable means of cure. The dosage must be carefully controlled, for direct sunlight, especially in high altitudes, is a powerful force not without capacity for harm. A climate of strong, continuous sunshine makes feasible an uninterrupted schedule of treatment.

4. Humidity.—The actual and especially the relative humidity of the air is perhaps the most important single factor in our comfort out of doors. It has most to do with the rate of heat loss from the body surface and with our endurance of the extremes of heat and cold. The drier the air the better each is borne, and the more enhanced the value of the direct sunlight.

5. Precipitation.—The important desiderata are a low annual rainfall and a reasonably even distribution of it through the year, so that the hot days of summer may be refreshed by short showers, and the rain or snowfall of winter be not too frequent or too long continued.

6. Wind.—A moderate regular movement of the air is most desirable for its effect on the cutaneous systems, both nervous and circulatory. It is the movement of the air upon the skin which stimulates and gives the exhilaration so associated with fresh air.

To be shunned are frequent, violent or long continued heavy winds, especially in the cold of winter or during seasons of high humidity. Equally is the close association of high wind with great dryness and dust an evil partnership for discomfort and harm.

How does climate help the patient with laryngeal tuberculosis, and what choice of meteorologic components is desirable in his case?

Tuberculosis of the larynx responds only in a general way and to a slight degree to the increased vitality induced by outdoor life and nutrition. The local laryngeal lesion is less directly affected than pulmonary tubercle by these factors. Its arrest is more dependent on the third member of the physiologic triad, rest.

Under the establishment and maintenance of complete rest the prognosis of laryngeal tuberculosis is much better than popularly believed. This complete rest, incomparably the most important part of the treatment we can bring to bear, is curiously difficult to secure.

The first, the most effective means to this end, the hardest to obtain, is silence, the absolute avoidance of all phonation. I need not enlarge upon this statement before the Laryngological Association, but I do wish to put the whole weight of

my professional experience into urging you to impress upon your patients and your pupils an appreciation of its importance and value as a working therapeutic fact and not a theory only.

Next in value to silence in securing the fullest rest to the larynx is the abolition, reduction or control of cough, from whatever source it arises.

The cough of infraglottic origin, rising from the pulmonary disease, will lessen with the improvement in that lesion.

Climate, as I have shown, is a valuable aid in securing that arrest and often gives surprisingly prompt results in diminishing the cough. The local laryngeal irritation, most soothed by rest, may occasionally need local sedative applications. It is, however, to a considerable degree affected by atmospheric conditions presently to be mentioned, the control of which may greatly assuage the patient's discomfort.

The supralaryngeal cough caused by nasal, and especially pharyngeal trouble, is a factor of great importance in its wear upon the patient. From my observations it is not sufficiently appreciated or given enough detailed care. Even in purely pulmonary tuberculosis no small fraction of the most annoying cough is alleviated by proper and painstaking care of the catarrhal or obstructive congestion of the upper respiratory area. In laryngeal tuberculosis the cough from these sources is especially harmful, for it remains always a nonproductive, unnecessary cough of purely mechanical violence.

Now, it is in helping control and lessen the cough arising from the nose, the pharynx and the glottis that certain climatic factors play a definite and direct part. So important and so readily demonstrated is this role that the presence of a tubercular laryngeal lesion calls for especial consideration of them in the choice of climate. The later development of a laryngeal tuberculosis may make for the first time a change of climate advisable.

A patient with laryngeal tuberculosis does not endure well excessive heat or cold. Such patients are prone to loss of appetite and poor nutritional balance, even before any pain on swallowing has occurred. This early loss of weight and the frequent accompanying anemia is out of proportion to the added amount of tubercular disease.

I believe it is the result of anxiety, discouragement and

fear born of the knowledge and constant evidence of this complication. Consequently any added cause for poor appetite and assimilation, such as heat or humid weather, is to be avoided.

Equally do such patients suffer from great cold, especially at night, and the irritation from breathing very cold air may excite so much cough as to prevent sleeping out. Thus one of the most valuable opportunities for combining fresh air and rest will be lost. Even though the daytime cold is modified by bright sunshine, very cold nights or too wide a diurnal range in temperature are to be avoided. For these reasons it may be advisable for a patient who can afford it to make a winter sojourn in a more southern, warmer station and change to a cooler, more bracing region in the summer months.

Abrupt or marked change in the temperature of the respired air readily induces cough, as we well know. Climates characterized by such sudden or frequent changes are to be avoided.

Damp air, especially if at all cold or in motion, is an immediate excitant of cough to an inflamed larynx or sensitive rhinopharynx. Therefore the greatest benefit will accrue to the patient in a mild, equable climate, with a dry air, low relative humidity and long periods without wet weather, one, too, in which the precipitation is fairly evenly distributed in short downfalls rather than in a prolonged rainy season.

Strong winds and dusty air are sedulously to be avoided. Frequently in the same region of generally similar climatic conditions one locality will have a topography yielding shelter from the prevailing wind. It will so be entirely suitable, while a station near at hand not so protected is undesirable.

Such local details are important to consider, even after the general problem has been settled. Indeed the whole success in the cure of laryngeal tuberculosis is a matter of appreciation of, and enforcing attention to detail.

In this connection may I add a word, even if it seem a criticism? Too often we see patients sent long distances from home at a sacrificing cost to gain the advantage of a better climate for living out of doors, who, because of a laryngeal lesion, take frequent or even daily trips to the physician's office. There they sit in a crowded, often poorly ventilated room waiting their turn for local applications. This travel

and waiting is undertaken frequently when the exertion involved or presence of fever should forbid should conduct. Any such patient with acute laryngeal tuberculosis which needs regular treatment should be cared for at home. If the laryngologist cannot give the time for such visits the patient will be best placed in a sanatorium where the means for local treatment are at hand, and where he does not have to pass his waiting time indoors rereading a last year's copy of *Outdoor Life*.

These briefly are the principles underlying the use of climate in the cure of laryngeal tuberculosis.

There is no specific climate for tuberculosis.

The disease may heal in any climate.

Some climates, however, offer the patient an incomparably better opportunity to make full use of the three requisites for cure: an outdoor life, increased nutrition, physiologic rest.

Laryngeal tuberculosis does not require a climate essentially different from that for pulmonary disease.

It does benefit, however, from attention to details. These are care in selecting a milder climate without extremes of heat or cold, especially the latter; freedom from frequent sudden changes of temperature, damp air, particularly in winter, high winds, and dust.

A careful consideration of the balance between the patient's needs, his means and the reasonable advantage to be gained from a change in surroundings is necessary to avoid disappointment or disaster. To make a correct selection the physician must understand the climatic characteristics of both the home and the contemplated resort. He must have an accurate knowledge of and an interest in meteorologic statistics and be able to interpret them properly in terms of physiologic effect upon the patient.

Future advance in the best utilization of climate will come with a greater appreciation of the fact that the physical modalities of temperature, humidity, sunlight, wind and barometric pressure are real and definite in their action. The more complete our study and knowledge of the physiologic response which they demand from a patient the better use we shall be able to make of these climatic components in the environment we select for the invalids who seek our counsel or depend upon our care.

L.

THE TREATMENT OF TUBERCULOUS LARYNGITIS
BY SUSPENSION LARYNGOSCOPY.*

By L. W. DEAN, M. D.,

IOWA CITY.

In discussing the question of the treatment of tuberculous laryngitis by suspension laryngoscopy I shall speak of this procedure only as it applies to my own work, I realize full well that while I am able to do my very best work with the larynx exposed by suspension, some others more accustomed to expose the larynx for endolaryngeal operations in a different way can do work equally well and with just as favorable results. I am fully convinced that each of us should perform endolaryngeal operations by the method with which we are most expert.

Using proper precautions, endolaryngeal operations may be performed upon the tuberculous larynx by suspension without detriment to a coexisting quiescent pulmonary condition. At least, the lung experts who keep our patients under observation cannot detect deleterious results.

During the earlier third of my laryngologic career I operated my cases of tuberculous laryngitis by indirect laryngoscopy; and during the latter third by suspension laryngoscopy and direct laryngoscopy. It is certain that during the middle third results secured were much better than those of the first, and those secured during the latter third are much better than the results of treatment during the second period. This improvement in results is not entirely due to a change in the method of doing the endolaryngeal work. However, suspension laryngoscopy helped very much.

One-half of our cases today receiving galvanopuncture, curettage, etc., have the work done by direct laryngoscopy. In my hands these patients do not get as good results as those

*Read before the forty-third annual congress of the American Laryngological Association, Atlantic City, N. J., May 30, 1921.

that are suspended. It is quite impossible for me to do as accurate work by direct laryngoscopy as by suspension. I have done many more endolaryngeal operations by the direct method than by suspension. I cannot place my cautery or knife as accurately by the former as by the latter method, neither can I protect the larynx so well from the cautery point. As to whether the patient is to be suspended or treated by direct laryngoscopy we will discuss later.

Unless there is some contraindication to its use, suspension laryngoscopy is to me the procedure of choice for endolaryngeal operations on the tuberculous larynx. The well illuminated larynx is thoroughly exposed. Both hands of the operator are free. He may have in one hand a spatula to expose better or to protect a certain area in the larynx, and in the other his galvanocautery point, punch or curette. He is at liberty to turn to his instrument table and select, if necessary, a different instrument without interfering with his work. He may take in his left hand a laryngeal speculum and expose the upper end of the trachea, the anterior commissure or the interarytenoid space, leaving his right hand free for operative work on the part exposed. There is no hurry. I frequently demonstrate the patient to sixteen students without the patient objecting. If there is any inconvenience from the suspension it is during the first few minutes. The patient who is suspended the first time may feel that he is suffocating. The tuberculous case is particularly favorable for suspension. The emaciated neck makes the procedure a very easy one.

Suspension laryngoscopy in laryngeal tuberculosis is indicated only in children old enough to be controlled and in adults. The use of a general anesthetic in this class of cases should not be considered. This prevents suspension laryngoscopy with young children. The work is done under local anesthesia. There is no excuse for loosening teeth. I frequently attach the tooth clips to a dental bridge, using a lead protector. There should not be the slightest danger of jaw fracture. The patient should be rapidly suspended, using every precaution for the patient's comfort. To get a good view it is not necessary to separate the jaws widely. Separating the jaws too widely may add to the patient's discomfort. It is not always necessary or advisable to bring the anterior

commissure into view. It is never necessary to raise the patient's head from the table. Once suspended there is no reason for hurrying with the patient.

The anesthesia: Morphin $\frac{1}{4}$ grain, atropin $\frac{1}{120}$ gr., is given twenty minutes preceding the operation. Ten per cent cocain is applied to the epiglottis and larynx, using a cotton swab. The swab is held in contact with the epiglottis and cords until all tendency to gagging disappears.

Immediately following the operation the patient is placed in a croup tent for six hours. We have never had a post-operative edema or hemorrhage of any consequence following the removal of the epiglottis of endolaryngeal operation on a tuberculous larynx by suspension. We have had marked edema following endolaryngeal operations by the direct method and hemorrhage following the removal of the epiglottis without suspension. Suspension prevents these sequelæ by permitting of exact incision and cauterization when operating in the larynx and so thoroughly exposes bleeding points that they may be properly handled.

For amputating the epiglottis suspension laryngoscopy is the procedure of choice. Under local anesthesia, using the short Lynch tongue spatula, the epiglottis is distinctly exposed. It is grasped with a tenaculum forcep and, using a Lynch knife, cleanly severed at its base. I have not noted any hemorrhage of importance following this procedure. It requires but a short time.

Sometimes the shortest laryngeal spatula is too long. I then substitute the long clips used by Lynch with his tooth plate for the short clips. This brings the spatula forward on the tongue and gives a better exposure. This is more often necessary when working on the lingual tonsil by suspension.

It is not within the province of this paper to discuss the indications for endolaryngeal surgery in tuberculous laryngitis.

I will try to outline my conception of the conditions under which suspension laryngoscopy should be used and try to indicate the class of cases in which it has seemed to us to be particularly beneficial.

From July, 1919, to April 5, 1921, we had in our service 143 cases of tuberculosis of the larynx. Seventy-three re-

ceived operative treatment, 37 were operated upon by direct laryngoscopy, and 36 by suspension. Dr. Scarborough, who is in charge of these cases, reports of those suspended all but a few secured improvement, most of them marked improvement, and a considerable number apparently recovered. The 37 cases are those who never were operated endolaryngoscopically except by the direct method. If we would compare the number of endolaryngeal procedures by direct laryngoscopy with those by suspension in the forty or more cases of laryngeal tuberculosis that we have under our care we would find that the number of operations by direct method would be several times greater than that by suspension. Included in the 36 cases suspended are all cases who had suspension perhaps only once. Most of our cases have work done on the larynx by direct laryngoscopy before the pulmonary expert considers them sufficiently quiescent for suspension laryngoscopy. After the first suspension most patients tell me that the suspension is not particularly disagreeable. Some patients seem always to have much subjective discomfort. As long as there is no pulmonary or systemic reaction we are not concerned with this. Suspension laryngoscopy, at least the first time it is used, is a decided strain on most patients, and there is greater chance of a reaction following its use than that of direct laryngoscopy. The decision as to whether the operation is to be performed by direct laryngoscopy or suspension is made by the pulmonary expert. He approves of suspension for those cases who can have the endolaryngeal work done in this way without much risk of a reaction. The suspension in our hands gives the best results, and if it can be used without detriment to the patient it is the method of choice. It is particularly desirable to suspend those cases needing cutting and curetting operations.

Early in our work several cases had reactions lasting for several days. Dr. Scarborough tells me these were of no importance and that no case has had a serious setback because of suspension. During the last year the reactions following suspension have been eliminated almost completely if not completely by a more careful supervision of the cases. A few days ago, because of rather indefinite indications that one of our cases was not doing well, the patient was not suspended.

She had a marked relapse. If she had been suspended this would have been charged to the operation.

Not only are the cases watched and studied carefully before and after suspension by the pulmonary expert, but the laryngologist gives the larynx very careful study. Three days after the operation on the larynx I go over my cases very carefully, noting just what has been the result of cautery or curettage. Then repeated careful examinations are made once a week. The frequency of suspension depends upon the needs of the larynx. Occasionally we have a case when galvanocautery is used under suspension every two weeks. These cases are usually ones that are discharged from the sanitarium whose larynges are scarred, the result of previous operations and the healing process and who have returned for cauterization of suspicious small areas in the larynx.

The patients upon whom we do suspension laryngoscopy are the favorable cases. So many of them do well that we keep them together. Those who do well help the others in carrying out their long period of treatment.

The first essential thing in treating laryngeal tuberculosis by suspension laryngoscopy is to have the patient under the supervision of a pulmonary expert who has authority to say this patient shall or shall not be suspended. Only by such a procedure can serious results be prevented. I never recommend treatment by suspension. I do advise it if the pulmonary expert thinks best. The patient must be examined and approved of by the pulmonary expert each time the patient is suspended. He must be watched carefully after each suspension. At times I find that so far as the laryngeal picture is concerned that six or eight cases should be suspended the next day. Frequently only one or two appear for the work. The pulmonary expert has not approved of the work being done at this time. Later when conditions are favorable the patient is sent for the endolaryngeal work under suspension.

Our tuberculous laryngitis cases are divided into four classes for treatment: First, those who remain in bed and receive only the simple medication; second, those who may sit up and have applied to the larynx mild astringents and antiseptics; third, those who receive rapid endolaryngeal surgical

procedures by direct laryngoscopy; and lastly those who are operated upon under suspension. The pulmonary expert having before him the laryngologist's findings decides in which class the case belongs. He decides whether or not the patient is in condition to have the very careful work done in his larynx which is so beneficial and which can best be done by suspension laryngoscopy. Excepting the cases for removal of the epiglottis all cases suspended have quiescent pulmonary conditions. The endolaryngeal procedures used by direct laryngoscopy are not so extensive as those done in the quiescent cases under suspension. Excepting an occasional case whose pulmonary condition is such as to allow them to go home they are all in the sanitarium under the supervision of a pulmonary expert as long as the latter considers it advisable.

While suspension laryngoscopy seems to me to be the ideal condition for the performance of endolaryngeal operations in cases with quiescent pulmonary conditions, it is particularly adapted to the treatment of superficial tuberculous ulceration of the trachea. If these ulcerations are high up, using the laryngeal spatula these cases may be readily cauterized. If situated low down in the trachea a tracheoscope may be passed under suspension and proper treatment instituted.

LI.

GENERAL MEASURES IN THE TREATMENT OF
LARYNGEAL TUBERCULOSIS.

BY LAWRASON BROWN, M. D.,

SARANAC LAKE, N. Y.

My appearance before you today must recall to your minds the opening sentences of one of Cicero's orations against Cataline. My temerity in accepting the invitation of your secretary was brought about by the fact that some laryngologists, none of whom I believe is a member of this society, seem to consider tuberculosis of the larynx a local disease and to treat it accordingly.

While tuberculous laryngitis is rare in children and more often found at autopsy, it occurs in about 25 per cent or more of adults with pulmonary tuberculosis, slightly more in men than in women, and next to tuberculous enteritis and colitis is the most frequent complication of pulmonary tuberculosis, due most likely to direct infection of the part by the sputum. Even early cases, cases in the incipient or minimal stage, are not spared (12 per cent), but as the pulmonary disease progresses the laryngeal complication becomes more frequent (moderately advanced, 26 per cent; far advanced, 45 per cent). The importance then of a complication so frequently seen among patients with pulmonary tuberculosis cannot be exaggerated.

Laryngeal tuberculosis is rarely if ever a primary disease, a statement with which I am sure many of you will agree. I am familiar with Donellan's paper (Transactions seventh annual meeting American Laryngological, Rhinological and Otological Society, 1901, page 277), in which he attempts to prove that primary laryngeal tuberculosis is not so rare as it is usually considered. He has collected many cases which he says had the first symptoms of tuberculosis from the larynx. The lungs were normal, as experts could detect no changes.

Today since the X-rays have been widely used in pulmonary disease we know that such evidence—i. e., the usual physical examination—alone, is worthy of slight consideration. He quotes two cases with autopsies, one of which had an old diffuse tuberculous laryngitis, had "recent granulations in one apex," and the second, described by B. Frankel (D. M. W., 1886, page 490), had ulcerative tuberculous laryngitis for five years with tubercle bacilli in the sputum and normal lungs at autopsy. Birkett (Osler & McCrae's System, Vol. III, page 630) says but three cases have been described (Demme, Pogrebenski & Orth). So if it is in practically every instance secondary to tuberculosis elsewhere, usually pulmonary, as seems most probable, the problem is not the treatment of a laryngitis alone any more than the problem of typhoid fever is the treatment of a diarrhea alone. In both diseases these manifestations may thrust themselves upon our notice, demanding emphatically treatment—treatment, however, which may prove of little avail unless general treatment is enforced.

The general treatment of tuberculosis is the same, no matter what organ is involved. At the risk of repeating what is very well known to all of you, I would like to stress a few points concerned in the general treatment of laryngeal tuberculosis. Some twenty years ago we refused all patients with laryngeal tuberculosis at the Trudeau Sanatorium, for we felt the prognosis was bad, and with the treatment we used at that time it was nearly always fatal. More recently, however, we have not hesitated to admit patients with laryngeal tuberculosis, provided, of course, that it was not too extensive and that they were otherwise eligible. Our results have been very satisfactory. We are no more laryngologists today than we were then, but one vital essential in the treatment of tuberculosis has become, if I may so express it, part of us. I refer to rest. Today, to use his expression, we put the patient on silence and give the larynx absolute rest, except for such movement as occurs in breathing, swallowing and coughing. We forbid whispering, whistling and every other use of the larynx. The results from this absolute rest are just as striking as they are in the case of tuberculosis of the knee, of the hip, of the spine or indeed of any other organ that can be given nearly 100 per cent of functional rest. I have been struck by

the fact that few patients who fell under my care had been kept silent. I have wondered if it were not due to a mistaken kindness on the part of some physicians who knew but who thought it almost cruel to use such drastic measures. I can assure you that while it is hard it is far from unbearable, for I myself have used a pad and pencil and uttered no sound for six weeks. Having done this myself, I have not the slightest hesitation in demanding it from my patients, and it is always a surprise to me how readily they agree to it and how conscientiously many of them carry it out. This method has changed our entire outlook upon the prognosis of laryngeal tuberculosis and, in the more slightly affected, recoveries now replace fatalities. It is true, of course, that more careful examinations of the larynx reveal earlier lesions, which are, I believe, often prevented from progressing.

Absolute rest recalls that in pulmonary tuberculosis it is at times necessary to put a lung out of commission by collapsing it, by splinting it, so to speak, with air. Absolute rest of the larynx can probably be most nearly attained by performing tracheotomy and the use of a tube. Dr. Chevalier Jackson (Trans. tenth annual meeting American Laryngological, Rhinological and Otological Society, 1904, page 123) has reported three cases of laryngeal tuberculosis, supposed to be primary, who wore tracheotomy tubes and got better. In the vast majority of cases such radical measures are not necessary, and in others the great amount of pulmonary secretion would certainly prove very trying and the results, I fear, would be very uncertain.

I would not imply that you do not advise rest, but I read in articles on the treatment of tuberculous laryngitis by excellent laryngologists statements such as this: "Vocal rest is a very necessary adjunct to the successful treatment of many cases of tuberculous laryngitis." "Vocal rest" may mean no singing, no shouting, no making of speeches, but as much talking as the patient desires. "The patient should not be permitted to use his voice," writes another, "except in the mildest whisper, and even this should be restricted in amount." Rest in laryngeal tuberculosis should be defined in no uncertain terms and, as I have said, should be, for a time at

least, absolute. Put a card on the head of the bed stating that the patient is on silence and no conversation is permitted, as has been suggested by Robertson. How long such absolute rest should continue must depend upon how the lesion progresses. Lip whispering, than ordinary whispering, next an occasional sentence in speaking tones is the method of progression, but singing, shouting, public speaking, should be avoided for some months after recovery.

Personally I go further in the rest treatment and do not hesitate to put my patients to bed for six weeks, with wide open windows, or better still, upon a porch during the day and in a well ventilated room at night. I do this for the following reasons: Pulmonary tuberculosis is usually present, and partial rest of the lungs as much as is possible is thus effected. Cough, which may injure the larynx when excessive, is better controlled by rest in bed than by any other means, for reduction of the number of the respirations means lessened irritation of the irritable lungs, consequently lessened secretion, and in turn lessened cough, and so less sputum flowing over the larynx.

All of us believe in the conservation of natural resources. The conservation of our bodily forces in the struggle against any chronic disease like tuberculosis is far more important. Where these are conserved I like to picture to myself the increased amount of antibodies that may be formed, the increased reactions of the cells about the focus to the poison, the increased and more rapid formation of scar tissue. If this is in part hypothetical, we do know that fatigue in animals lessens resistance and decreases antibody formation.

There is still another point I would like to stress. In chronic disease, and especially in tuberculosis, almost any change under rational conditions benefits the patient. The greatest response to change of climate occurs in the first few weeks, and for this reason I urge all of my patients to take advantage of it by remaining at rest, usually in bed. I cannot help feeling that if patients with laryngeal tuberculosis were put to bed and kept silent at home at the very onset of treatment, at the time when the iron of response is hot and will yield most readily to the hammer of advice and treatment, the

tendency toward recovery would be much more marked and gratifying than it is at times today, even though you cannot change his quarters and must be satisfied with open windows and no porch in his usual surroundings.

Most of you, I am sure, will agree with me that recovery from laryngeal tuberculosis depends in most instances largely upon the condition of the pulmonary tuberculosis. With advancing pulmonary disease, fever and poor nutrition, it is difficult to promote healing in a tuberculous larynx, but I have seen it done with the aid of the electrocautery. However, the lungs play such a large part in the treatment of this condition that any line of treatment that fails to consider primarily the lung disease may in the end result in the loss of the patient.

This period of rest that I have mentioned gives the patient a chance to readjust his ideas and, more important still, affords him an opportunity to become orientated and gives us a chance to educate him along the lines he must follow if he wishes to recover. As soon as I deem it advisable I put him on exercise, for a good general condition and good muscular tone, which has greatly increased under bed rest in fresh air, are conducive to a more speedy recovery.

I have dwelt upon this point, for I have thought it possible that a few laryngologists still seemed to hold to the idea that local treatment was the important thing. I do not believe less in suitable local treatment but more in local and general rest, for the usual hygienic dietetic treatment properly applied with local rest will cure about 50 per cent of all early cases.

In regard to local treatment, I feel that the laryngeal dropper, devised by Dr. Yankauer of New York, is not yet widely enough known and used, for I can now recall only one or two patients who have come to me with laryngeal tuberculosis who had ever previously employed it. One patient, I remember, an important person, had a laryngologist or his assistant pay her two visits a week (at \$25.00 a visit) to drop argyrol into her larynx, which she herself learned to do in two or three days with the laryngeal dropper. The important advantage of this dropper is the fact that the patient can remain quiet and at home and apply local treatment efficaciously. I do not mean to imply that local treatment in the office can

be entirely done away with, but to see a poor, weak patient dragging one foot after another, running a daily temperature of 100 to 103 degrees, coming two or three times a week to the physician's office to have his throat touched with lactic acid or formalin or some other solution, however much temporary relief it gives, is to me a sad commentary upon the art and practice of medicine, for such injurious visits should not be and are not necessary. I realize that busy men cannot treat these patients at their homes. I also realize that they demand treatment. The best solution of the problem seems to me to be for the tuberculosis specialist to acquire sufficient knowledge of local treatment to enable him to carry out the directions of the laryngologist at the patient's home.

To produce rest and to facilitate swallowing, freedom from or lessening of pain is necessary. I have tried injection of alcohol into the superior laryngeal nerve with some success, but the respites have never been long. I have not tried resection of this nerve, which has yielded some good results. (See Mayer, *Ab. Br. Med. Jr.*, 1921, I, 35; also W. Kl. W., 1921, Jan. 6th.)

The insufflation of anesthesin or orthoform has been helpful. In these cases the laryngeal dropper has proved a god-send. Before the application of drugs I have the patient thoroughly rinse or wash out his larynx with physiologic salt solution. This removes in great part the tenacious mucus and permits the local applications to reach the surface of the ulcer. I have found that for most applications the dropper was far better than the atomizer, and just as efficacious as the intratracheal syringe in the physician's hands. Further, the patient can apply the drug before each meal and whenever the pain becomes excessive. Menthol (1 per cent) in oil is an excellent application to begin the method upon, for if the patient swallows it no harm is done. Then stronger solutions of menthol, emulsions of anesthesin, or, what I have found is best of all, Freudenthal's emulsion of orthoform and menthol, can be applied as necessary. I have by these methods been able to avoid largely cocain with its disagreeable after-results. In a few cases I have not hesitated to use morphin hypodermatically when necessary.

The apparently marked benefit produced in intestinal tuberculosis by the ultraviolet rays, or at least by some factor concerned in the treatment, have encouraged us in their use in laryngeal tuberculosis, for it can be administered in the patient's home. Some have devised special lamps for application of these rays directly to the larynx, feeling that they would act like the sun rays, which I understand have been so successfully employed in Colorado. I have used natural heliotherapy in five cases and have had excellent results in two, though two were too far advanced to hope for any benefit. On the other side, in two patients with chronic disease, general radiation was employed and excellent results obtained. I have used ultraviolet rays from a mercury vapor quartz lamp, but excellent results have been obtained (by Blegood) with the use of arc lamps, which give off much violet ray.

More recently I have been interested in the use of a thin solution of gelatin, suggested by Mr. Petroff from his studies in physical chemistry. He afterwards placed in our hands a strongly immune serum (sheep or goat). Spraying the larynx with these substances apparently afforded a few patients marked relief, but in others was of little avail.

Laryngeal tuberculosis has long been looked upon as a contraindication to pregnancy, for when this condition occurs the larynx, if at all seriously affected, often quickly grows worse. In such cases I should not hesitate to advise abortion in the first three months of pregnancy, but after this time little benefit can be hoped for from the operation. Students of tuberculosis are not yet agreed upon the causes of the bad effects in many instances of pregnancy and labor upon pulmonary and laryngeal tuberculosis.

In conclusion, I would like to state my views as follows:

About 100,000 persons die from pulmonary tuberculosis in the United States every year. At least 40 to 50 per cent of these have some laryngeal tuberculosis. If patients live on the average about three years, there must be 300,000 patients in the United States, of whom 25 to 50 per cent have laryngeal tuberculosis. In other words, about 100,000 have laryngeal tuberculosis. Many of these are people with slight or no means. Treatment of their throat condition must in large part devolve upon the medical men doing tuberculosis work. They feel

their shortcomings and are eager to turn to you for help. But when they see a patient with a high fever dragged to a laryngologic dispensary, which they know is wrong, they realize that they or someone else has erred. You gentlemen can help solve this problem, for it is yours and ours. We cannot do so alone, and I venture to say that you cannot do so alone either. The tuberculosis specialist must direct the general treatment and will be, I am sure, for a long time to come the only person to give such laryngeal treatment as you advise.

LII.

THE SURGICAL TREATMENT OF LARYNGEAL TUBERCULOSIS.*

BY ROBERT LEVY, M. D.,

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The curability of laryngeal tuberculosis is no longer a mooted question, although the means by which the cure is accomplished is still a fruitful source of difference of opinion. So many cases of spontaneous cure have been recorded that nature's method, at any rate, is accepted without objection. Man's faith in nature's wonderful achievements discourages dispute, especially when confirmed by human observation.

On the other hand, there still seems to be a large number of practitioners, general as well as special, whose belief in the virtue of active therapeutic measures is, to say the least, extremely weak, if not entirely wanting. This is particularly true of such measures as those of which this paper treats, and can be explained by the firmness with which tradition grips the profession, and the difficulty with which certain old and accepted views are uprooted.

It is within the memory of many members of this association when to attempt any active treatment for laryngeal tuberculosis was little short of criminal. No great wonder, therefore, that a radical reform should be difficult of acceptance, and especially when such reform swings the pendulum too far. The enthusiasm following Heryng's, Krause's and Goughenheim's reports, 1885 and 1887, was rather short lived, and within a very few years a reaction set in which has done much toward clarifying the treatment of this affection.

The majority of laryngologists whose practice includes many tuberculous cases have come to the conclusion that the surgical treatment in some form or other is a valuable factor in the management of this disease, and still one occasionally sees reports in which only palliative or medicinal measures are rec-

*Read before the meeting of the American Laryngological Association at Atlantic City, May 31, 1921.

ommended. It is only fair to say that the most authentic of these reports are not of the most recent dates, as, for example, the one of 241 cases reported by the Rutland State Sanatorium,¹ dated 1914. I am inclined to think that a report from such an institution made at the present time would at least mention favorably the galvanocautery. In addition, it is the writer's personal observation that, exclusive of published opinions, there is a not inconsiderable number of men who, through lack of faith or patience in treating these cases, or who having no regular connection with a tuberculosis sanatorium, find so much to discourage them that they readily condemn all methods of treatment except the hygienic.

While the majority of writers agree that surgical treatment in some form or other is of more or less value, there is still a certain lack of definiteness as to the method, the extent of its applicability or specific indications for its use.

Under the head of surgical treatment are included:

- a. Intralaryngeal measures.
- b. Extralaryngeal measures.

The latter can be dismissed with very little discussion, for neither tracheotomy nor laryngotomy with excision of invaded parts nor laryngectomy has been used extensively enough by a sufficient number of men. Laryngectomy is certainly making no progress in the treatment of laryngeal tuberculosis; its status seems to be about the same as stated in 1913, that "so long as success has attended simpler measures, and so long as this success is rapidly increasing the number of cures, extensive life endangering operations must be condemned."² Arnoldson,³ after an elaborate compilation on external operative measures, concludes that such operations, excepting tracheotomy, can only be considered where it is possible to remove all of the disease. This is impossible in all except early cases, and in these, other less radical measures preclude the necessity of laryngectomy or even laryngotomy.

Tracheotomy may be considered in quite a different light. Its value as a palliative measure, whether for the relief of dyspnea or dysphagia, is well recognized in spite of the objections (Lake⁴), that it interferes with cough and expectoration, that the wound becomes seriously infected or leads to

rapid extension of the disease of the lungs. These objections are more theoretical than practical.

As early as 1879 Beverly Robinson⁵ recommended tracheotomy for curative as well as palliative reasons, on the same principle that Moritz Schmidt did—that is, for the purpose of putting the larynx at rest. Nevertheless, tracheotomy has received but little more encouragement than laryngectomy, and one cannot help but voice the thought that the last word as to the value of this procedure has not been said, and that some courageous, perhaps bold, operator will show us its true worth.

Intralaryngeal surgical intervention includes incision, excision, curettage and galvanocautery. Obviously, these measures should not be used indiscriminately or promiscuously. Nor are they necessarily to be exhibited only for curative purposes. The destruction or removal of diffuse tuberculous infiltration or circumscribed masses has its value for the relief of dyspnea or pain quite beyond any other method of treatment. The reason for this is based on the well known studies of Goughenheim and his pupil Dansac,⁶ who showed that the pain in tuberculous laryngitis, or arytenoiditis, as they called it, was due to certain nerve lesions, producing hyperplasia of the nerve endings, "pseudoneuromata." Dansac says, "we have been struck by the relief which surgical treatment nearly always gives to the sufferings of these patients," which observation holds good today to a very large degree.

From this point of view it is easy to see that many cases which were considered unsuitable for surgical treatment may now be given the benefit of such treatment when used with discrimination.

The contraindications for surgical treatment laid down by Heryng⁷ were:

- "a. Advanced phthisis with hectic and wasting;
- b. Diffuse miliary tubercle of the larynx and pharynx;
- c. All cachectic conditions;
- d. Severe stenosis of the larynx;
- e. Patients exhibiting fear and nervous excitability."

Except in cases of severe stenosis prior to tracheotomy, properly selected surgical measures properly carried out, and with palliation more in mind than cure, these contraindications

may be largely disregarded. Obviously one would not indulge in extensive curettage or galvanocautery in the presence of widespread edema or intense redness with acute manifestations. Nevertheless, the writer has seen great relief to pain following the judicious application of galvanocautery, even in diffuse miliary laryngeal and pharyngeal tuberculosis.

The ideal condition for surgical interference is one in which the tuberculous process is definitely limited or circumscribed. This occurs in so-called tuberculomata, and in the very early stage of the disease. Unfortunately, many cases are not seen early enough, the consequence being that the area involved cannot be definitely determined—in fact, this is often impossible, even though the laryngoscope reveals a fairly well circumscribed infiltration or ulceration.

A specimen presented before the American Laryngological, Rhinological and Otological Society⁸ in 1906, in which, post-mortem, a section from the trachea showed tuberculosis, demonstrated how far from the site of the disease as seen with the laryngoscope the lesion may exist. Fetterholf⁹ in 1914, in a "Study of the Larynx in 100 Cases Dying of Tuberculosis," showed how extensively the disease was distributed. Of course, this was to be expected in advanced cases, but the point is that, even though it were possible to recognize the very earliest manifestations, the fact remains that patients are not seen by a competent laryngologist until considerable involvement has taken place.

Recognizing therefore that for surgical treatment the ideal early, limited, circumscribed lesion is rarely presented, does more or less extensive involvement constitute a contraindication? The answer is found in the many cases reported in which the patient was not only relieved of distressing symptoms but in which not infrequently the voice was restored and the disease arrested.

Saupignet¹⁰ removed the mucosa and perichondrium over the arytenoid region by repeated operations until cicatricial tissue covered the parts, resulting in relief to dysphagia and respiration and improvement in the general condition. This method is certainly too radical to find favor with many, but it shows what can be done in the way of healing, even in extensive diseases. Lockard¹¹ showed how readily healing takes

place, even though the operation does not remove all tuberculous involvement in a large number of epiglottidectomies, and his experience has been amply confirmed by others. The following is an illustrative case:

Miss A. K., 22, had pleurisy one year prior to coming to Colorado. Cough and expectoration had existed about six months. Dysphagia and slight aphonia had existed for about four weeks. There was rapid loss of weight, rapid pulse, slight fever, and physical examination showed active involvement of both lungs. The larynx was extensively affected, the epiglottis being pale with nodular tumefaction and large ragged ulcerations. The right aryepiglottic fold was pale and uniformly swollen.

The patient was highly nervous, and it was with difficulty that a satisfactory laryngoscopic examination could be made. After one month of rest and simple palliative measures, treatment by galvanocautery and excision was instituted. Now at the end of three months there is seen a moderate degree of tumefaction, which is still slightly nodular in spots, partial destruction of epiglottis, but no ulceration or other evidence of activity. The patient's general condition is greatly improved, the physical signs showing less activity and the weight increased 16 pounds.

Much has been said of the danger of wound infection and extension of the process. The effect of trauma in localizing tuberculosis or spreading a local lesion seems still to be a subject of dispute. Laboratory investigations have not been conclusive, for example: Pel Leusden¹² showed that "crushing of a kidney in rabbits, followed by the intravenous injection of tubercle bacilli, resulted in the preferred localization of the tuberculosis in the injured kidney to the exclusion of the rest of the body," while Corper¹³ found that "crushing and the subcutaneous injection of chemical irritants just prior to the subcutaneous injection of virulent human tubercle bacilli in various sized doses, had no appreciable influence upon the progress of the infection as compared with that obtained in control guinea pigs."

Clinically many observers have presented instances in which trauma seems to have been a factor in etiology, as, for example, a case referred to by Walsham,¹⁴ in which pharyngeal

ulcerations following the accidental swallowing of caustic potash became tuberculous in an individual suffering from pulmonary tuberculosis.

On the other hand, the great number of operations performed daily on tuberculous individuals is pretty good opposing evidence.

Incision.—As early as 1868 Marcet, quoted by James,¹⁵ advocated puncture and scarification in the indurated form; little account was taken of this until Schmidt in 1880 advised incision, with or without lactic acid rubbings. Only a few men besides the originators have used these procedures to any extent. As in edema from other causes, incision is of some value, but it cannot be considered as effective for curative purposes as other measures. In the indurative form the contraction hoped for cannot be accomplished in any degree as satisfactorily as by galvanocautery. Its use, therefore, should be confined to cases of pronounced edema.

Excision.—In 1883 Schnitzler¹⁶ removed a tuberculous tumor endolaryngeally. Since then the excision of tuberculous masses, whether as typical tumors, circumscribed papillomatous vegetations or localized infiltrations, has been common practice. Even though all of the invaded structure cannot be extirpated, as referred to above, the removal of portions thereof is attended with satisfactory healing, relief of symptoms, and is often followed by arrest of the local lesion. This is a much more liberal view than was taken a few years ago, when many writers, including the author (1906), limited the application of this operation "to those cases in which there is a certainty or a strong probability of completely removing the entire focus of disease."¹⁷

The cases best suited for excision, in addition to the well localized ones, are those showing few acute manifestations—in other words, the pale irregular nodular infiltrations whose activity is manifestly sluggish. The cases presenting much red edematous swelling, submucous gray deposits of tubercles with general symptoms of rapidly progressing disease, such as high fever, etc., are better adapted for other methods of local treatment. A good illustration of the value of this procedure is found in the case recently reported by Sir Dundas Grant,¹⁸ in which the lesion was so extensive that the patient suffered

dyspnea and regurgitation of liquids in addition to other symptoms, and in which relief was obtained by intralaryngeal removal of tuberculous masses from the anterior and posterior commissures followed by galvanocautery to vocal and ventricular bands.

Histologic examination of masses removed from tuberculous larynges has not always shown tuberculosis except where the disease, while sluggish, was still active. Infiltration, papillomatous or smooth, often persists in the posterior commissure, constituting the principal cause of hoarseness. These masses often represent an end result, and when removed show, according to Dr. Hilkowitz, who examined them for me, "a papillary overgrowth of the surface epithelium, the corium being the seat of a round cell infiltration running between dense fibrous tissue."

The excision of the epiglottis in part or entire is now generally practiced to the extent that Lockard and a few others do, and still its value is unquestionable. Removal of small areas of infiltration, smooth or with nodular vegetations, or ulcerations involving the free margins of the epiglottis, lend themselves readily to this operation, especially if followed up with galvanocautery.

Amputation of the epiglottis is not as simple a procedure as one might infer. I have had one case of severe hemorrhage and two in which secondary cicatricial contraction caused marked stenosis. One often sees the under surface of the epiglottis covered by tuberculous ulcerations in which the temptation to remove the entire organ is very great, but judicious application of galvanocautery will usually cause satisfactory healing.

Nevertheless, epiglottidectomy is strongly advised, especially for the dysphagia when due to involvement of the epiglottis principally, and for those cases in which the tumefaction interferes with satisfactory treatment of the rest of the larynx.

Curettage.—This is less practiced than formerly, if we exclude excision by the so-called double curette. Its value is limited to surface manipulation, thus cleansing and stimulating sluggish ulcerations. It is less useful than excision for actual removal of disease areas, and less effective than galvanocautery for the relief of pain in more acute lesions.

Galvanocautery.—Of all surgical measures the galvanocautery is the most generally and favorably recommended. Its value seems well established, and its future as a therapeutic agent seems assured. Voltolini¹⁹ in 1867 made a bold though unsuccessful attempt to establish it. Grünwald²⁰ gave us a refinement of technic. The names of those in whose hands galvanocautery has given satisfaction are too numerous to mention, including Gleitzman,²¹ Casselberry,²² Iglauer,²³ Freudenthal,²⁴ Ruedi,²⁵ Killian²⁶ and Thomson.²⁷ Casselberry warned against its use except in skilled hands, being fearful of untoward results. Freudenthal speaks of Siebenmann's experience in which the reaction was so severe as to necessitate tracheotomy.

Of course, one deprecates the performance of any intralaryngeal operation by those unskilled in laryngologic practice; and still, if not too large an area is treated at one sitting, the danger of serious consequences is extremely small.

Galvanocautery is applicable to a very large percentage of cases, either for palliative or curative purposes. Sir St. Clair Thomson²⁸ found it indicated in 20.22 per cent of 178 cases. In 100 private cases seen in the past few years, the writer used it in 22 cases. I am firmly convinced that its use can be extended to nearly every stage of laryngeal tuberculosis, after the initial period of anemia or hyperemia—that is to say, in all forms of infiltration, smooth, nodular, papillomatous; in all varieties of ulceration, small, large, sluggish, painless or painful; even in the final stage, when necrosis is involving underlying cartilage, it may relieve suffering and help clean the parts. Applied superficially, its value to sluggish ulcerations in removing necrotic tissue and in stimulating granulations is far superior to chemical agents.

Applied by deep puncture to infiltrations its action is ideal, for as Wood²⁹ puts it, "the eschar produced by burning prevents reinfection," if this were necessary, "until the tissue has become sufficiently resistant to protect itself, sealing the lymphatics and blood vessels."

This seems a much more reasonable explanation than that of Ruedi,³⁰ who believes the thick slough acts as a protection; at least, it is more desirable, for it does not necessitate extensive cauterization at one sitting. Wood tells us also that

following the actual cautery "a retarding influence is exerted beyond the area actually destroyed by the heat."

Surgical treatment of laryngeal tuberculosis is not of itself the most important factor in the management of this condition. It has its limitations. There is no place here for extreme views, and its application should have a rational basis. It is only one factor in the treatment, being a valuable adjunct to other local, general, specific, hygienic and climatic measures, besides, as Dennis³¹ has said, shortening the time required to bring about favorable results.

It frequently becomes necessary to institute very mild local treatment in combination with rest, fresh air, etc., before resorting to any form of surgical intervention. It may, however, be said that of all forms of local treatment, it is the most important, being the most effective. It is valuable, both as a palliative agent and as a curative measure, often being indicated for relief of symptoms when a cure is out of the question. Operation often exercises a favorable influence on the pulmonary condition, and as Ruedi has shown, galvanocautery has been of value in high altitudes which affected the lungs favorably, but which were without influence on the larynx.

In the above an attempt has been made to give surgical treatment of laryngeal tuberculosis its proper place in the management of this most serious complication and in a measure definitely to outline its special indications and applicability; but after all is said, one might paraphrase Sir St. Clair Thomson's reply to a question asked of him by Drs. Cohen and Swain at the 1919 meeting of this association. "The chief thing in determining the exact condition, local and general, for the exhibition of operative treatment is the skilled eye of the diagnostician, because it is impossible to put down in words the conditions that one sees."

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LIII.

CASE OF INTRANASAL ETHMOID EXENTERATION
ACCOMPANIED BY UNCONTROLLABLE
HEMORRHAGE; DEATH.

BY DUNBAR ROY, M. D.,

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Suppurative ethmoiditis occurs by no means infrequently in the practice of every rhinologist. Nasal polypi with the accompanying necrosing ethmoiditis is a familiar picture. After all the arguments have been adduced against its use, the writer is still convinced that the term necrosing ethmoiditis, attributed to Woakes, is the best general term suggestive of the real pathologic findings.

The management of these cases so as to produce a cure will tax the medical and surgical skill of the best in our profession. Whether by the use of either the external or internal operation, the fact still remains that what one would denominate as an actual cure is not always obtained. All can be benefited, but many of these will not be absolutely free from some catarrhal discharge, while in others the resulting scabby condition will be most annoying, and even the destruction of their sense of smell is by no means a remote possibility. Hence suppurative ethmoiditis must be looked upon as one of the hard problems for the rhinologist. It is not the purpose of this paper to discuss the various intranasal operative procedures which are used by different rhinologists, for the writer believes that he has obtained his fair share of success by the use of the snare, curette and punch forceps, but the object here is to present the record of one case where complications arose and where these were contributory to the final death of the patient. The more extended becomes my experience with operations on the ethmoid the more am I convinced that the exenteration of the ethmoid body is no simple procedure and should always be undertaken with the greatest precaution, and every step of the operation should be under visual inspection. The pres-

ence of suppurative ethmoiditis compels one to have great respect for the ability of nature to confine the suppurative process to these cells instead of there being a frequent extension of the same process to the cranial cavity. It is only after operative procedures that we are at all likely to have such an extension of the pathologic process, and it is for this reason that all operative work in this locality should be done with the most extreme caution. The fact that the literature will show a number of serious complications attending this operation, and even a few fatal cases, behooves us to consider it the major intranasal operation we are called upon to perform, especially if undertaken at the same time with a sphenoid involvement.

With these preliminary remarks the writer wishes to report a case of intranasal ethmoid exenteration accompanied by practically uncontrollable hemorrhage, followed by death upon the operating table where extreme measures were being instituted in our effort to save the patient.

E. J. B., age 18, a strong, robust country lad, consulted me on October 28, 1918, in reference to a very severe purulent discharge from both nasal cavities and which had been present for several years. He was also suffering with quite severe headaches. Family history was negative.

Examination of the nasal cavities revealed a suppurating ethmoiditis with numerous polypi. Transillumination showed both maxillary antrums clear, although both were punctured in order to be sure of the diagnosis, as also both frontals. X-ray plates showed practically the same thing. No blood examination was made. On the next morning an intranasal exenteration was performed on the left side. The whole ethmoid region was polypoid and soft, requiring the use of the snare, curette and cutting forceps. A good opening was also made through the nasofrontal duct and the frontal sinus thoroughly irrigated. The sphenoid was also opened, because it was very soft and a curette easily entered the antrum. No packing was used and there was no undue amount of hemorrhage. In three days the patient returned home with instructions to irrigate his nasal cavities with a saline solution.

On January 22, 1919, about four months after the first operation, the patient returned for another examination. The

left side appeared in excellent shape, with only a slight amount of catarrhal secretion. Headache on that side had entirely disappeared. Over the right or unoperated side there was still present severe headaches and a profuse purulent discharge. The next morning this side was operated upon in the same manner and with the same care and thoroughness as the left. The frontal was irrigated and also the sphenoid. No unusual amount of bleeding occurred and no packing was used. The next morning the patient reported to the office and the operated nasal cavity seemed to be in good shape. He remained in the city for a few days so that I might irrigate the cavities myself. The operation was performed on Thursday. On the following Monday, four days after the operation, he came to my office late in the afternoon on account of hemorrhage from the right side. This was checked without difficulty and without the necessity of a tampon. He remained in the office for an hour and, there being no further bleeding, he was allowed to return to his hotel. Seen the next morning, Tuesday, and also Wednesday, when the nasal cavity appeared to be doing nicely. On Wednesday night, about 11 o'clock, a message from the hotel informed me that Mr. B. seemed to be bleeding to death. I immediately told them to rush him to the hospital in an ambulance. This was done; at 12 o'clock midnight, with the assistance of a colleague, I underdressed from both sides, anteriorly and posteriorly. He had already been underdressed from both sides, anteriorly and posteriorly. He had already been given a hypodermic of morphin and atropin by the house surgeon and temporary measures had also been used. A large sterile postnasal cotton tampon was used and both sides packed tightly with sterile gauze from the front to the posterior opening of the nasal fossæ. He was immediately given 30 cc. of horse serum intravenously and $\frac{1}{8}$ gr. morphin, 1/200 gr. atropin hypodermically every six hours. This seemed to control the hemorrhage. We left the hospital at 4 a. m.

On visiting him about 9 o'clock the next morning, only a slight serous bloody oozing was present. Temperature, 101.2; pulse, 110. Ice packs were kept over the nose and only liquid diet given. It was noted that the blood coagulated readily, giving no indications of his being a hemophiliac. Horse serum was given subcutaneously every four hours. In addition to

this, pituitrin, coagulose and other various remedies of this kind were used. At this time the patient was considerably nauseated and vomited blood. Orange albumen was administered with other liquid diets. There being considerable pain in the abdomen and evidence of gas accumulation, an enema was administered, which brought relief from these symptoms. In addition to the bloody serous discharge there was considerable flow of mucopus from both nostrils. At 6 p. m. some of the tampon was removed from the left side.

January 30th. Patient had a fairly good night. Morning temperature, 101; pulse, 102. Complains of severe headache, probably due to the damming back of the purulent discharge. Saline solution was dropped freely into both sides every hour. Small doses of calomel and soda were given to counteract the flatulency.

January 31st. Patient had a very restless night. Morning temperature, 101.2; pulse, 88. Aspirin administered for headache. No signs of bleeding. Patient feeling much more comfortable. Taking light diet. Evening temperature, 99.2; pulse, 100.

February 1st. Patient slept fairly well. Nasal cavity looked encouraging. At 6 p. m., the patient began to bleed from both nasal cavities. Ice compresses used. Morphin and atropin administered hypodermatically. Horse serum given intravenously. At 7 p. m., both sides were bleeding freely. After consultation with my colleague, Dr. Lokey, the packing in both sides was removed and the cavities irrigated with hot saline solution. The blood clotted freely. The hemorrhage was very profuse from both sides, but by exclusion and close observation the majority of the hemorrhage seemed to be coming from the left. Nothing was left to do but to repack, and this we did with iodoform gauze post-nasal and both sides of the nasal cavities. This checked the bleeding. At 9:30 p. m., horse serum was again administered. Bleeding very slight from nasal cavities and no bleeding from postnasal space.

Sunday, February 2d. Temperature, 101; pulse, 92. Patient very uncomfortable and still some blood oozing from both nasal cavities. Tampons kept saturated with adrenalin chlorid. Ice compresses continuously applied and coagulose given subcutaneously. This treatment was continued during the day.

At 8 p. m., temperature was 102, and pulse 120. He had now started bleeding profusely again from both nostrils.

We now called in consultation Dr. W. P. Nicolson, a general surgeon. As all indications pointed to the fact that most of the hemorrhage was coming from the left side, it was Dr. Nicolson's opinion that the tying of the common carotid on that side would probably stop the bleeding and that the seriousness of the case demanded radical action.

At 9 p. m., the patient was taken to the operating room, and under gas anesthesia Dr. Nicolson ligated the common carotid on the left side, Drs. Roy and Lokey assisting. While the patient was under the anesthetic both nasal cavities were cleaned and repacked with iodoform gauze and a fresh tampon placed in the nasopharynx. No bleeding could be discovered when the patient left the operating room and his general condition was very good. At 12 m. his pulse was 110; at 1:30 a. m., it was 144. Some blood oozing from both sides.

Next day, Monday, February 3d, at 6 a. m., the temperature was 100.2; pulse, 92. Patient complained of considerable pain over the right eye and both eyelids were swollen. Both eyes were kept washed with boric acid solution. Patient was quite uncomfortable, and there was considerable mucopus dripping into his throat. At 9 a. m., temperature, 100; pulse, 90. Iced applications over the nose and eyes and small doses of calomel and soda administered on account of the accumulation of gas in abdomen.

Tuesday, February 14th, 6 a. m., temperature, 98; pulse, 120. Patient very uncomfortable. Enemas given. Patient taking liquid diet. 6 p. m., temperature, 101.2; pulse, 110. Packing removed from left side of nose. No bleeding. Patient seems much better. Greatly troubled with mucopus in pharynx and larynx. This was removed with suction, much to the patient's comfort.

Wednesday, February 5, saline given. Soft diet readily taken. Temperature at noon, 101.2; pulse, 110. Packing removed completely from right side of nose. No bleeding. Patient much more comfortable and able to expel the mucus from his throat. Saline solution with carbolic acid used every two hours.

February 6th. Temperature, 100.3; pulse, 106. Patient had a fairly good night. Light diet being taken. 2 p. m., postnasal packing entirely removed. No bleeding. This gave the patient great relief.

Friday, February 7th. Temperature, 98.2; pulse, 100. Patient had a good night. Mouth and nose irrigated. Bowels moved normally. At 5:30 p. m., the external dressing was changed for the first time by Dr. Nicolson. One stitch abscessed. Small amount of seropus. Iodoform dressing and bandage applied.

Saturday, February 8th, 6 a. m., temperature, 99.4; pulse, 90. At 6:30 a. m., hemorrhage started from the neck incision. Dressing changed by the house surgeon and the wound tightly packed, which controlled all hemorrhage. At 10 a. m., patient had another hemorrhage from the incision. Blood clotted immediately. Dr. Nicolson again saw the patient. Given 1/6 morphin, 1/150 atropin. Wound packed again. No signs of bleeding from nose and throat. Patient had renewed hemorrhage again in afternoon.

At 8 p. m., Dr. Nicolson decided to place the patient under an anesthetic and to stop the bleeding surgically. Patient was removed to the operating room at 8:30. Gas ether anesthetic given by the same anesthetist as at the previous operation. Temperature at that time was 101.3; pulse, 100. Patient took but a few whiffs of gas when he stopped breathing. Oxygen and artificial respiration were used. The heart continued to beat for ten minutes after all breathing had ceased. Death. No autopsy was allowed, but Dr. Nicolson opened up the incision on the operating table and found a most peculiar condition. All of the neck muscles and fascia were undermined and an immense cavity found filled with clotted blood. This extended even up to the chin. The suture on the carotid was firm and there was complete ligation.

Like many others, I have operated upon a number of cases where there has been very severe hemorrhage, but this was the only case where the condition taxed my surgical ingenuity to its utmost. Knowing that the posterior ethmoid cells derived their arterial supply from the sphenopalatine, a branch of the internal maxillary, from the external carotid and from the ethmoidal branches of the ophthalmic artery, a branch from the

internal carotid, we felt assured that the tying of the common carotid would take care of all the hemorrhage on the left side. This proved correct, as all bleeding ceased from the nasal cavities and all tampons were removed. But why the hemorrhage should start from the wound in the neck, and this also be so uncontrollable, is a question difficult to answer. It is of course unfortunate that no blood examination was made, but this was due to the fact that the blood clotted freely and we were expecting every moment to have the hemorrhage under control. Evidently a slow bacteremia had been progressing for some time, due to the absorption for years of pus from the ethmoid cells, and this had undermined the coats of the blood vessels as well as the integrity of other body tissues. It is undoubtedly true that the immediate cause of death was the general anesthetic, but it is equally true that the same might not have produced death had there not been such an excessive loss of blood and the whole system in such an abnormal state. So that we are not entirely in error in saying that death was due to uncontrollable hemorrhage. Such cases, while unfortunate in their termination, make us realize that these extreme cases of necrosing ethmoiditis are not without their dangers.

Arrowsmith¹ reports one case in a negro male, age 56, from whom a growth in the nose was removed by the cold snare. This was followed by severe hemorrhage and later by repeated attacks of nosebleed. On readmission to the hospital the left nostril was exposed by a lateral rhinotomy, after Moure's method, and a friable yellow mass of material which had involved and destroyed the entire left ethmoid region and inner wall of the orbit was removed. The bleeding from the field of operation was very profuse in spite of a preliminary ligation of the left external carotid. A similar tumor was removed from the supraclavicular region, where there was also considerable hemorrhage. For this reason the patient, "already greatly reduced by his previous loss of blood," died in three hours after leaving the operating room. The nasal and supraclavicular tumors were alike in gross appearance—both hypernephroma.

Felix⁴ reviews many cases of fatalities following nasal operations. While he notes several deaths due to meningitis after the ethmoid operation, he makes no mention of hemorrhage

as a cause of death in these cases. These cases of meningitis are included in the following notes, under the name of the author making the original report:

Dabney³ notes three deaths following the ethmoid operation due to meningitis; none due to hemorrhage.

Hajek⁵ mentions one case in which death following the ethmoid operation was due to meningitis.

In the discussion of Hajek's paper, Lack says that in over 300 ethmoid operations he had but one death. This was due to meningitis. He adds that of all other operators using his technic who reported to him, eight stated that they have had no fatalities; the other three report six deaths. All were due to meningitis. Lack says: "I have heard of no death from any other cause."

In this discussion, Ballenger states that he had but one death, also due to meningitis; he had never had any other complication "of any moment." He reported over 200 cases without his being called to check hemorrhage occurring after operation.

Halle⁶ notes that he has performed 76 ethmoidal and frontal sinus operations by his intranasal technic. In one of these cases a meningitis developed that proved fatal. No mention of hemorrhage as a dangerous complication.

Hinsberg⁷ reports three cases of death following intranasal exenteration of the ethmoid. All due to "infection" (meningitis). No mention of hemorrhage.

Tawse¹³ reports two deaths from meningitis following the ethmoid operation.

McCullagh⁸ advocates Mosher's technic for ethmoid exenteration. He states that Mosher has told him of two cases of postoperative meningitis following this operation, but not among his own cases. No fatal case of hemorrhage is noted. In regard to postoperative treatment, McCullagh says:

"The principal part of the postoperative treatment of these cases is noninterference with nature. Personally, I order no local treatment for forty-eight hours. Packing should never be used unless hemorrhage demands it or the patient is so situated as not to be within easy reach of skilled assistance if secondary hemorrhage occurs."

Pratt¹⁰ states that he has performed between 200 and 300 operations on the ethmoid. In none of these does he record a

fatal or even dangerous hemorrhage. With his technic, he says, there is little bleeding.

Shambaugh,¹² after describing the technic for the ethmoid operation, says:

"Most of the cases require no tampon if the patient remains at the hospital, where directions can be left for the introduction of a tampon in case secondary bleeding requires it. Occasionally one meets with severe bleeding at the time of operation which may require the introduction of a tampon. This should always be removed not later than the following day."

Ballenger² says in regard to hemorrhage following the ethmoid operation:

"Hemorrhage nearly always attends the operation, and it may either persist, or appear later as a secondary hemorrhage, though the latter is comparatively rare. By packing the nose as described, this complication may be controlled. A slight serosanguinous oozing may continue for twenty-four or forty-eight hours, in spite of the gauze packing, but it is of no serious consequence. If the patient is operated on in a hospital and remains there for three days, it will rarely be necessary to pack the nose."

Oppenheimer and Gottlieb⁹ state that blood examinations should be made prior to nasal operations, and if either the coagulation time or the bleeding time vary much from the normal the operation should not be undertaken without preliminary treatment to improve the blood condition.

They report no fatal case of postoperative hemorrhage. In one case an ethmoid operation was followed by "secondary oozing for five days." The coagulation time in this case was markedly delayed.

Weinstein also notes the need for the determination of coagulation time of the blood before nasal and nasopharyngeal operations.

Pugnat¹¹ reports four cases of postoperative hemorrhage, not fatal, two following turbinectomy and two tonsillectomy. In all these cases there was evidence of cirrhosis of the liver or other hepatic insufficiency. Other investigators have found that hepatic insufficiency may alter the coagulability of the

blood, and he believes that this factor should be considered in preparing for nasal operations.

Theisen and Fromm¹⁴ report the use of horse serum pre-operatively in nose and throat operations in any case where they expected an unusual amount of postoperative bleeding, either from a history of the patient or of the patient's family.

The ethmoid operation, they say, "is usually attended by profuse bleeding," but following the use of the serum there was very slight loss of blood in their cases.

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RADIUM IN THE TREATMENT OF CARCINOMA OF
THE LARYNX, WITH REVIEW OF THE
LITERATURE.*

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Laryngeal carcinoma, one of the saddest afflictions with which the laryngologist has to deal, has for many years been a vexatious problem, and indeed will no doubt remain so until the scientists and investigators have been able to determine its etiology more accurately. For this reason, no doubt, our efforts at local eradication have been much hampered.

With the advent of radium, and its effect upon cancerous growths in other regions of the body, our optimism became apparent, and during the last few years we have been striving to determine the value of radium in the treatment of cancer of the upper respiratory tract, the larynx in particular. Most of us have used it in all stages of the disease. The results are varied and confusing. Some report cures; the majority failures. Most textbooks condemn it.

Janeway, in the Memorial Hospital Report of 1917, reports twenty-seven cases of cancer of the larynx which were treated by radium. All were dead at the time of the report but one, and he was being treated for recurrence. Janeway was of the opinion that much better results should be obtained by radium in the larynx, judging from the effects on similar growths situated elsewhere. These cases were treated by means of tubes inserted into the larynx and plaques applied to the neck.

Dr. Douglas C. Quick, of the same institution, exhibited before the Eastern Section of the A. L. R. & O. Society, in February of this year, two cases of carcinoma of the larynx, in which remarkable results were obtained. These cases had been treated by the insertion of radium emanations into the growth.

*Read before the forty-third annual congress of the American Laryngological Association, at Atlantic City, N. J., June 1, 1921.

Dr. Delavan, in the Transactions of this society for 1919, reports four cases of laryngeal carcinoma treated by radium. Two had complete laryngectomies after being thoroughly treated by radium, and two of his cases were treated by radium alone, which showed complete retrogression.

Jackson and Patterson, in his book on Peroral Endoscopy and Laryngeal Surgery, reports a laryngeal carcinoma treated by radium, which was applied directly to the growth, and the patient lived for one year following the treatment.

Dr. A. W. Watson, in the Transactions of this Society for 1917, reports one case successfully treated by external and internal applications of radium.

Dr. y de Barajas, in *Medicina Ibero*, Madrid, Spain, 1919, reports 58 cases treated by radium, with not one complete cure. He states that the growths undergo a process of amelioration, even to apparent cure, after the first application of radium, if dosage is adapted to the case and to the subject. All cases, however, he states, recurred in a very short time. He finds that the dosage in the larynx should not be less than 45 or 50 mg., nor more than 75 to 80 mg., with maximum duration of two hours each application, and should be made as frequently as reaction after treatment will permit. He also further states that radium merely retards the development of some varieties of cancer, hastens it in others, and completely cures none.

The writer has treated sixteen cases of carcinoma of the larynx with radium since January, 1917, with the following results:

One case in which the total laryngectomy had been performed, which had recurrence in the thyroid gland, died six months after operation. Another, in whom a complete laryngectomy was performed two weeks ago, has had large doses of radium within the larynx, and radium plaques applied externally for the past year. While doing nicely, it is too early to record accurate results. Another, in which thyrotomy had been performed, with recurrence of the disease in the external wound, was treated by radium needles and died eight months after the thyrotomy. One with early involvement on the right side of the larynx was treated by radium needles inserted directly into the growth, had early retrogression, later showed signs of beginning activity, was thyrotomized, and with the

assistance of Dr. William L. Clark, was treated with electric coagulation. The patient is still living and there is no evidence of recurrence after four months.

The remaining twelve cases which were considered inoperable were tracheotomized and treated vigorously by introducing needles into the growth and radium applied externally under the direction of Dr. William L. Clark. All are dead but one, who is losing ground rapidly.

In two of these remaining twelve cases there was marked retrogression of the growth, so much so that the site of the lesion was hardly perceptible, and the patient's condition remained so for several months, recurrence developed, and in spite of the use of radium they died in about a year after their first treatment.

Out of 109 cases above recorded, 10 were living at the time the reports were published, showing a mortality of about 91 per cent.

The method of applying radium in the cases which came under our observation was as follows: The first three or four cases were treated by introducing the capsule properly screened into the larynx, after the patient had been thoroughly cocaineized, using a 20 per cent cocaine solution within the larynx, preceded by a hypodermic of $\frac{1}{4}$ grain of morphin sulphate. The radium was held in position after the manner described by Jackson and Janeway. Later $12\frac{1}{2}$ mg. needles, to which strings were securely tied, were introduced into the growth, the number depending upon the size of the growth. These were left in position, in some instances for seven to twelve hours. In addition to the needles external applications were also used.

From reports, the writer is of the opinion that more recent improved technic in the use of radium emanations, as practiced at the Memorial Hospital in New York, offers more encouraging results.

Conclusions.—From the writer's experience, and from published reports, it would seem that radium is only indicated in the so-called inoperable cases of carcinoma of the larynx, meaning those cases in which there is marked involvement of the cervical glands, epiglottis, base of the tongue, and the esophageal wall. Its analgesic effect on these cases, in moderate

doses, constitutes one of the most important benefits. It is valuable for those patients who refuse operation. It perhaps exercises a beneficial effect in blocking the lymphatics before a radical operation upon the larynx. Such brilliant results have been obtained in early intrinsic malignancy of the larynx by thyrotomy that in these cases radium should not be thought of except possibly as a postoperative measure. In the more advanced type of intrinsic cancer of the larynx, laryngectomy has prolonged the lives of many by surgeons in all parts of the world. Here again radium should not be considered a means of treatment except before or after operation.

Case 1.—T. H., white, male, aged 83. Carcinoma of larynx, cervical glands and base of tongue. Admitted to Jefferson Hospital October 23, 1917. Patient died without improvement December 29, 1917.

The following is the treatment by Dr. Newcomet:

One hundred mg., 4 hrs., placed at various places on neck around tube that was inserted in throat.

Oct. 23, 1917. 100 mg., 4 hrs., on right side neck towards front.

Oct. 25, 1917. 100 mg., 3 hrs., on left side neck (front).

Oct. 27, 1917. 100 mg., $3\frac{1}{2}$ hrs., under chin directly above tube.

Oct. 30, 1917. 100 mg., 4 hrs., on left side of neck, low down, below level of tube. Examined. No reaction yet. To have one more treatment on right side and one directly under tube.

Nov. 1, 1917. 100 mg., $3\frac{1}{2}$ hrs., right side neck low down below level of tube.

Nov. 3, 1917. 100 mg., $3\frac{1}{4}$ hrs., on neck low down under tube. Examined. No reaction yet, but to be laid off for ten days. Return Nov. 13.

Nov. 13, 1917. Examined. No sign of reaction yet. Patient to return in one week.

Nov. 20, 1917. 100 mg., 4 hrs., on right side of neck about level with the tube and toward side of neck.

Nov. 26, 1917. 100 mg., 4 hrs., on left side neck about level with the tube and toward side of neck.

Dec. 29, 1917. Patient died about four days ago.

Case 2.—E. M., white, male, aged 61. Admitted to Jefferson Hospital August 9, 1920. Carcinoma of the larynx, intrinsic. Operation refused. Patient still living, but growth is beginning to involve the esophagus.

The following is the treatment by Dr. Newcomet:

Aug. 9, 1920. 50 mg., 3 hrs., on right side, median line of neck, near larynx. 50 mg., 3 hrs., on left side median line of neck. Filter 1 mm. lead, 1 in bandage.

Aug. 11, 1920. 100 mg., 3 hrs., over larynx on median line of neck. Filter 1 mm. lead, 1 in bandage.

Aug. 13-14, 1920. 100 mg., 3 hrs., on neck below level of larynx. 100 mg., 4 hrs., right side neck, high. 100 mg., 4 hrs., right side neck, low. 100 mg., 3 hrs., left side neck. 100 mg., 3 hrs., above level of larynx. Filter 1 mm. lead, 1 in bandage. (100 mg., 17 hrs., on neck.)

Case 3.—M. K., white, male, 60 years of age. Carcinoma of larynx and esophagus. Admitted to Jefferson Hospital March 13, 1920. Died April 14, 1920.

Following is the treatment by Dr. Newcomet:

Mar. 16, 1920. 50 mg., 2 hrs., in larynx. Radium in silver tube, covered with rubber, placed by Dr. Lewis.

Mar. 16, 1920. 100 mg., 3 hrs., on left side of neck above level of larynx, a little to left of median line. Radium in 2 mm. lead and 1 in bandage filter.

March 17, 1920. 100 mg., 3 hrs., on center of neck below larynx.

Mar. 17, 1920. 100 mg., 3 hrs., on right side of neck above level of larynx.

Mar. 17, 1920. 100 mg., 3½ hrs., on right side of neck below level of larynx. Patient to return April 6 for examination.

April 6, 1920. 100 mg., 3 hrs., on left side of neck under angle of jaw. 100 mg., 3 hrs., left side neck, about an inch lower than previous treatment. 100 mg., 3 hrs., left side neck, about an inch lower than previous treatment. 100 mg., 3 hrs., right side of neck under angle of jaw. 100 mg., 3 hrs., right side of neck, about 1 inch lower than in previous treatment. 100 mg., 3 hrs., right side of neck, about 1 inch lower than in previous treatment.

Patient was admitted to hospital April 2, and gastrostomy

performed. Patient had not eaten for three days. On April 6th was able to swallow water without difficulty.

Died April 14, 1920.

Case 4.—L. B. M., male, white, aged 55. Carcinoma of larynx with involvement of cervical glands. Admitted to Jefferson Hospital Aug. 26, 1919. Died Oct. 12, 1919.

The following treatment by Dr. Newcomet:

Aug. 26, 1919. 50 mg., 20 hrs.

Sept. 11, 1919. Examined. Not much reaction. Has been coughing up a great deal of mucus in the last three days. Has had several weak spells, when he almost fainted. To be treated again as before.

Sept. 11, 1919. 50 mg., 20 hrs. Radium in lead tube placed over $\frac{1}{2}$ in bandage in lead collar. Radium in ten positions, moved every two hours.

Sept. 16, 1919. Examined. No change in condition. Patient still has a great deal of pain.

Oct. 2, 1919. 40 mg., $3\frac{3}{4}$ hrs., on left side of neck under ear.

Oct. 6, 1919. 50 mg., 3 hrs., on left side neck near tracheotomy tube.

Oct. 6, 1919. 40 mg., 3 hrs., on right side near tube.

Oct. 8, 1919. 40 mg., 3 hrs., on right side of neck near ear.

Oct. 8, 1919. 50 mg., 3 hrs., on left side of neck, low, near collar bone. Neck seems less swollen. Patient is feeling a little better.

Oct. 11, 1919. Patient had severe pain in right side of abdomen near border of ribs. Coughed up a great deal of very foul pus.

Oct. 12, 1919. Died. Conscious almost to time of death.

Case 5.—P. J. C., male, white, aged 64. Carcinoma of larynx, intrinsic. Laryngectomy, Aug. 21, 1919. Recurrence in the thyroid gland. Died six months after laryngectomy.

The following treatment by Dr. Newcomet:

April 19, 1920. 90 mg., $3\frac{1}{2}$ hrs., left side neck; radium in 1 mm. lead 1 in bandage. 140 mg., $2\frac{1}{2}$ hrs., on right side of neck, over abscess. 140 mg., 3 hrs., on right side of neck near angle of jaw. 140 mg., 3 hrs., on right side of neck on collar bone near median line. 140 mg., 3 hrs., on right side of neck about 3 inches from tracheotomy tube and level with

tube. 140 mg., 3 hrs., left side of neck under angle of jaw. 140 mg., 3 hrs., on left side of neck.

Case 6.—E. R., male, white, aged 65. Carcinoma of larynx with involvement of the cervical glands. Admitted to Jefferson Hospital May 4, 1920. Died July, 1920.

The following treatment by Dr. Newcomet:

May 4, 1920. 50 mg., in larynx above cords. Radium in silver tube covered with rubber, placed by Dr. Lewis. Patient coughed up the tube after it had been in throat for less than ten minutes.

May 4, 1920. 40 mg., $3\frac{1}{2}$ hrs., on median line of neck above level of larynx. 40 mg., 3 hrs., right side of neck above level of larynx, about 2 inches from median line. 40 mg., 3 hrs., right side of neck below level of larynx, 2 inches from median line. 40 mg., 3 hrs., left side of neck above level of larynx, 2 inches from median line. 40 mg., $3\frac{1}{2}$ hrs., left side of neck below level of larynx, two inches from median line. 1 mm. lead, 1 in bandage filter.

May 5, 1920. 140 mg., $3\frac{1}{2}$ hrs., on median line of neck at top of sternum. 140 mg., 3 hrs., left side of neck below angle of jaw near jaw bone. 140 mg., 3 hrs., left side neck below angle of jaw near collar bone. 140 mg., 3 hrs., right side neck below angle of jaw near jaw bone. 140 mg., $3\frac{1}{2}$ hrs., on right side of neck below angle of jaw near collar bone. 1 mm. lead, 1 in bandage filter.

May 27, 1920. 100 mg., 3 hrs., on right side of larynx, a little below level of larynx.

May 28, 1920. 100 mg., 3 hrs., over larynx.

May 28, 1920. 100 mg., 3 hrs., above larynx. 100 mg., 3 hrs., left side larynx.

May 29, 1920. 100 mg., 3 hrs., right side above larynx.

June 24, 1920. Choked up. Feels poorly. To be treated 24 hrs. on neck on July 9th.

July, 1920. Patient wrote that he was unable to come for treatment. Too weak to travel. Died.

Case 7.—J. P., male, white, aged 60. Carcinoma of larynx, intrinsic. Admitted to Jefferson Hospital July 7, 1920. Operation for thyrotomy July 9, 1920. Died February, 1921.

The following treatment by Dr. Newcomet:

July 7, 1920. 100 mg., $2\frac{1}{2}$ hrs., on neck at top of larynx.

100 mg., 3 hrs., on neck over larynx, a little lower than in previous treatment. 100 mg., 3 hrs., on neck at lower border of larynx. 100 mg., 3 hrs., on right side neck, about 3 inches from median line at upper edge of neck. 100 mg., 3 hrs., on right side neck at lower part of neck. 100 mg., 3 hrs., on left side neck, about 3 inches from median line, at upper edge of neck. 100 mg., 3 hrs., on left side of neck at lower border of neck. Filter 1 mm. lead, 1 in bandage.

July 24, 1920. No change.

July 27, 1920. Patient's throat, although inflamed, appeared better.

Aug. 14, 1920. Referred to dispensary.

Sept. 9, 1920. Repeat application. Treatment was considered necessary over sore spot on median line of neck.

Sept. 28, 1920. 100 mg., $3\frac{1}{2}$ hrs., on median line of neck over sore area from which pus is draining. 1 mm. lead, 1 in. bandage. Examination showed that disease had not progressed but is still confined to small area around larynx. 100 mg., 3 hrs., on neck below level of pharynx. 100 mg., 3 hrs., on neck above level of pharynx. 100 mg., 3 hrs., on right side of neck (high). 100 mg., 3 hrs., on right side of neck (low). 100 mg., 3 hrs., on left side of neck (high). 100 mg., 3 hrs., on left side of neck (low). Filter 1 mm. lead, 1 in bandage. 100 mg., 23 hrs.

Sept. 29, 1920. 100 mg., $1\frac{1}{2}$ hrs., on right side neck.

Oct. 25, 1920. 50 mg., $3\frac{1}{2}$ hrs., over sore spot over larynx on median line of neck. 1 mm. lead, 1 in. wood filter.

Oct. 28, 1920. Examination showed extending upward from sternal notch to the cricoid cartilage midline, a scar, in the middle portion of which there was an ulceration about 1 cm. long, slitlike, surrounded by a number of small nodules. Man's voice was about the same as before operation, speaking only in a whisper.

Nov. 1, 1920. 100 mg., $24\frac{1}{2}$ hrs., on neck in eight positions for about 3 hrs. each. Filter 1 mm. lead, 1 cm. wood. Four positions on right side neck, $3\frac{1}{2}$, 3, 3, 3, hrs. each. Three positions on left side neck, 3 hrs. each. One position, 3 hrs., over ulcerated area on center of neck.

Nov. 9, 1920. No gross change.

Nov. 23, 1920. Patient improved. No treatment deemed necessary.

Dec. 14, 1920. Doing well.

Dec. 28, 1920. Some discomfort.

Jan. 3, 1921. 100 mg., 24 hrs., in 8 positions, 3 hrs. each on neck. 1 mm. lead, 1 cm. wood. A large quantity of pus discharging from opening in throat. Patient feeling worse.

Feb. 1, 1921. 50 mg., 6 hrs., 4 needles around hole in neck over area of larynx, two on each side of median line, placed in skin at edge of opening.

Case 8.—H. L., male, white, aged 75. Carcinoma of larynx, with involvement of esophagus and cervical glands. Admitted to Jefferson Hospital Nov. 23, 1920. Still living, but losing ground rapidly.

The following treatment by Dr. Newcomet:

Nov. 23, 1920. 100 mg., 2½ hrs., on median line of neck above level of tracheotomy tube. 100 mg., 3 hrs., on right side of neck. 100 mg., 3 hrs., on right side of neck. 100 mg., 2 hrs., on right side of neck. 100 mg., 3 hrs., on left side of neck. 100 mg., 3 hrs., on left side of neck. 100 mg., 3 hrs., on left side of neck. 100 mg., 3 hrs., on left side of neck. 100 mg., 3 hrs., on left side of neck. Filter 2 mm. lead, 2 cm. wood (100 mg., 25½ hrs.).

Nov. 30, 1920. Felt better. Told to return in two weeks.

Dec. 14, 1920. Referred to Dr. Lewis.

Jan. 4, 1921. No over reaction.

The following cases were treated in conjunction with Dr. William L. Clark:

Case 9.—G. A., male, white, aged 55. Admitted to hospital March 8, 1919. Carcinoma of larynx and esophagus. Died about one year after the beginning of the treatment. Radium treatment began May 28, 1919. 50 mg. capsule 1 mm. brass filter covered with rubber tubing in throat 3 hrs.

July 11, 1919. 40 mg. capsule, 2½ hrs. throat.

July 25, 1919. 50 mg. capsule, 2½ hrs. throat.

Sept. 29, 1919. 50 mg. capsule, 2½ hrs. throat.

Case 10.—J. A. B., male, white, aged 43. Carcinoma of larynx with involvement of cervical glands and esophagus. Admitted to hospital May, 1919. Died in June, 1919.

May 14, 1919. 50 mg. capsule in 1 mm. brass filter covered with rubber tubing in throat 6 hrs.

June 2, 1919. Same as above.

Case 11.—J. C. S., male, white, aged 60. Carcinoma of larynx and esophagus. Admitted to hospital Aug. 30, 1920. Died Sept., 1920.

Aug. 30, 1920. 50 mg. pad 10 areas cervical region 4 hrs. each.

Sept. 8, 1920. 5-10 mg. needles, 2-5 mg. needles (60 mg.) in throat 22 hrs.

Case 12.—G. G., male, white, aged 60. Carcinoma of larynx, intrinsic. Admitted to hospital Oct. 1, 1919. Died Dec., 1919.

Oct. 1, 1919. 50 mg. capsule in throat 3 hrs.

Oct. 15, 1919. 50 mg. capsule $2\frac{3}{4}$ hrs.

Nov. 12, 1919. Five 10 mg. needles injected 12 hrs.

Dec. 8, 1919. 50 mg. pad cervical gland 3 hrs.

Case 13.—J. W. R., male, white, aged 59. Admitted to hospital June 22, 1920. Carcinoma of larynx with involvement of cervical glands, tonsil, soft palate and uvula. Died Aug., 1920.

June 22, 1920. Ten 10 mg. $\frac{1}{2}$ mm. nickel and steel needles injected in throat 16 hrs. 12 areas cervical region 50 mg. pad 4 hrs. each.

Aug. 2, 1920. Ten areas cervical region 50 mg. pad 4 hrs. each.

Case 14.—K. M., male, white, aged 59. Carcinoma of epiglottis, right side of larynx and base of tongue. Admitted to hospital Dec. 16, 1919. Died July, 1920.

Dec. 16, 1919. 25 mg. capsule 1 mm. thickness brass filter in larynx 5 hrs.

March 22, 1920. Eight areas each side of neck 50 mg. radium in needles in 1 mm. thickness brass filter covered with rubber tubing with $\frac{1}{2}$ in. thickness gauze pad.

May 7, 1920. 50 mg. capsule in 1 mm. thickness brass filter in opening in neck after incision of gland 20 hrs.

July 12, 1920. Five 5 mg. needles (25 mg.) in larynx 21 hours. 50 mg. pad 6 areas on neck 4 hrs. each.

Case 15.—C. M., male, white, aged 58. Carcinoma of larynx, intrinsic. Admitted to hospital June, 1920. Thyrotomy and electric coagulation. Still living and no signs of recurrence.

June 28, 1920. 5 mg. needles (20 mg.) $\frac{1}{2}$ mm. thickness nickel and steel in throat 5 hrs. 6 areas cervical region 50 mg. pad 4 hrs. each.

Aug. 9, 1920. 10 areas cervical region 50 mg. pad 4 hrs. each.

Dec. 8, 1920. 21 areas cervical region 50 mg. pad 4 hrs. each.

Case 16.—S. S., male, white, aged 57. Carcinoma of larynx. Admitted to hospital May 13, 1921. Treatment with radium before operation. Laryngectomy May 14, 1921. Still living and in splendid condition.

April 27, 1921. Three $8\frac{1}{3}$ mg. needles (25 mg.) in larynx 16 hrs. 12 areas cervical region 50 mg. pad 4 hrs. each.

LV.

AN ANALYSIS OF OVER FIVE HUNDRED CASES
OF PROGRESSIVE DEAFNESS.*

BY HAROLD HAYS, M. D.,

NEW YORK.

My intense interest in the diagnosis, treatment and general welfare of patients who have consulted me privately because of defects of hearing has led me to study very carefully the histories of those patients whom I have treated within the past five years in order to find out whether an analysis of these histories might not lead me to some more definite conclusions as to the present status of our treatment of these cases so that I might therefore be able to be more honest with myself as to the promises I could make this class of patients. It is a source of satisfaction to me to feel that otologists in general are more interested in the subject of progressive deafness and that they are getting away from the old empiric methods of treatment which often did more harm than good.

What a change has taken place during the past ten years since we have been able to make more exact interpretations of conditions because of our more accurate methods of diagnosis! I refer particularly to the more careful inspection of the nasopharynx, especially the regions of the eustachian tubes, brought about by the invention of that clever instrument, the Holmes nasopharyngoscope. One need no longer conjecture. A little time and patience is all that is necessary to give a definite concept of the picture that is present. Again the use of the electric otoscope, to which can be attached a massage apparatus, forms a valuable adjunct to our armamentarium, for by its means one is able to tell the exact condition of the membrana tympani, how much of the drum is rigid or relaxed, how much actual limitation of excursions of the drum there is, which may be accountable for a further progression of the symptoms.

For purposes of actual analysis, this paper should be statistical in nature, but statistics are dry, inaccurate and often mis-

leading. The general conclusions at which I have arrived I feel will prove of interest. Having been able to follow many of these cases for a number of years, I feel that I am in a position to make more positive statements than if the patients had not been private ones.

Etiologic Factors.—A careful inquiry had been made in most cases as to other members of the family having had any trouble with their ears. We speak of hereditary deafness, but such a term is misapplied in any case in which deafmutism is not directly traceable through a family for generations. But that there is a hereditary predisposition to a weakness of the ear mechanism cannot be doubted, although it is not present as often as is generally supposed. In the cases under consideration, very few of the patients knew of others in the family who were hard of hearing. In a small percentage, more than one member of the family was under treatment at the same time, and in a few instances three or more members of the immediate family were deaf. It is my opinion that we should not consider the hereditary tendency of the disease as of much value in the majority of cases but that where we do find a number of members of one family suffering from this same trouble, we must advise strongly that there is great possibility that future members of the same family will have to be extremely careful of their ears.

That the diseases of childhood play a great part in altering the mechanism of the middle ear and eventually causing a progressive deafness has been forcibly brought to my mind by an analysis of these cases. There are two classes of cases which deserve particular attention—patients who have had exanthematous diseases and those who have had the recurrent colds which are so often associated with diseased tonsils and adenoids. The chief exanthematous diseases are measles and scarlet fever. If one makes careful inquiry he will find that the majority of cases of progressive deafness, which belong to what one might call the hopeless class, have had one or both of these diseases, and that frequently there was ear trouble at that time. This brings up an important point which has been emphasized by Kerr Love and others, that few of these patients have had any attention paid to their ears after the acute symptoms of the

disease or the ear discharges have subsided. Inquiry among these patients shows that, at the time of the scarlet fever, for example, the ears were well taken care of, if there had been any inflammatory reaction present or if there had been any suppuration. But seldom were the ears examined after they went to school again, even if the family had noticed that their hearing was not as perfect as it had been before. Oftentimes the deficiency of hearing was not sufficient to cause any apprehension, either on the part of the patient or on the part of the parents, until, perhaps, the age of puberty. There is no doubt in my mind that an insidious process had been going on for many years and that if proper examinations had been made it would have been possible to correct the condition. From the data that we have in hand, from these cases and from the assertions that have been made by others, one is forcibly impressed with the fact that the most important treatment of progressive deafness is preventive treatment. I am of the opinion, more than ever, that most deafness is preventable and that it is the duty of the otologist to impress this fact upon the public.

The frequent repetition of colds in childhood is intimately associated with the question of the removal of tonsils and adenoids. Most of the cases under consideration had had their tonsils and adenoids removed at an early age. In many cases the operation was imperfectly performed, and in a number of instances had to be done over again in adult life. Most of these patients give a history of repeated earaches in childhood which must be seriously taken into consideration. But I believe that it is wrong to make a definite assertion that the removal of the tonsils and adenoids alone will be sufficient to clear up any tendency to ear troubles later on in life. An analysis of these cases shows plainly that there are many other factors, among which may be mentioned intercurrent diseases which bring about a devitalized condition of the child so that it is prone to a chronic inflammatory condition of the mucosa of the nose and throat. Much as we feel that the proper elimination of tonsils and adenoids will bring about the results we desire, there are too many instances in which we find that their removal has not influenced the ear condition at all. One then has to consider that the puny child who

is constantly suffering from an inflamed condition of the nose and throat with diminished hearing, needs to be gone over thoroughly to discover whether, for example, there is not some trouble in the endocrine system or perhaps in the gastrointestinal tract. It is extremely hard to get at these definite factors. Moreover, it has only been during the past few years that we have had them definitely called to mind. But I am able to pick out isolated instances in the series, in which I am sure that the persistent inflammatory condition in the nose, throat and ear has been due to some defect in the general system. Moreover, I am so sure of this that in the more careful histories we are taking today and in the more careful treatment we are giving children, we are paying more attention to general treatment and its effect locally than we are to local treatment by itself.

Mention has been made of the fact that complaints of marked defects in hearing are not made until after the age of puberty. In the cases under consideration, although a definite history could be obtained of scarlet fever or some other predisposing factor, it was seldom that the hearing was bad enough to be noticed and to demand treatment until after the fourteenth year. Whatever treatment that was begun then was given in a perfunctory manner and did little good. It has been my experience that children of this age cannot be made to appreciate the seriousness of their condition and will use every subterfuge to get out of treatment. Most of my adult patients have candidly admitted that they either did not have any treatment at this time or else that they were taken to otologists once or twice and then were told to return at regular intervals which they never did. This puts the blame for future trouble on the patient himself, although it is hard to make him see it from that point of view.

By far the majority of patients in this series have had some nose or throat abnormality and, at an earlier date, I collected a series of fifty of these cases to show the intimate relationship of pathologic conditions of the nose to chronic catarrhal otitis media. Since that time I have become more conservative and have felt that it was impossible to say, for example, that a deviation of the septum was responsible for the ear condition. It is a fact that almost all these patients have some

abnormality in the nose or throat or had such an abnormality which was corrected at an earlier date. But I regret to say that the correction of the nose and throat trouble has not by any means improved the hearing. For some years I hoped that this would be so, but a proper analysis has shown me that oftentimes the damage has been done so completely before the patient came to me that no amount of operative interference could correct it. In looking over these histories I find that there is a deviation of the septum or a sinus condition or some disease of the tonsils or some adenoid tissue. And if such a condition is directly connected with some pathologic condition of the eustachian tube, which seems to me to be continued because of the nose and throat abnormality, I advise that an operation should be performed; if, on the contrary, I can see no connection, I do not hesitate to advise that no operation should be performed. It is my opinion that most of these patients have suffered from too many operations upon the nose and throat, and that they have just cause for the feeling that their condition has been made worse because of too much meddling.

Symptoms.—Naturally, the symptoms that most of these patients have complained of is deafness in one or both ears. In the majority of cases they have felt that one ear is worse than the other, but careful tests have shown that the hearing is often worse in the ear of which they complain the less. About 50 per cent of the patients have complained of tinnitus, which varies in character and degree. In the more advanced cases the complaint of the tinnitus has been more than the complaint of the deafness. It is difficult to determine when this tinnitus has first come on, but as a rule it is the forerunner of the complaint of deafness. But this does not mean that it has preceded the deafness. It is only that the deafness has not been of sufficient degree to be noticeable until after the tinnitus has made itself evident. It is my firm belief that if the majority of these patients had been properly treated at the time that they first noticed the tinnitus a great deal could have been done to prevent further trouble. Paracusis has only been present in the more advanced cases, usually in patients who have been treated by a number of physicians over a long period of years. It has been my experience that patients who have a

paracusis Willisii will not respond to any treatment which we have at our command at the present time. In all probability the paracusis is due to a fixity of the ligament of the oval window which it is difficult if not impossible to overcome. Dizziness and nystagmus have seldom been noted except in those cases which demonstrate some trouble more deeply located beyond the middle ear.

There is a certain class of cases which demand our attention and which have not been differentially classified. I refer to patients who suffer from what I have termed "intermittent deafness." Such patients will state that their hearing is better at one time or another, is better in one climate or another. Any change in the weather seems to make a great difference in their hearing acuity. Any change in their physical condition seems to make a great difference in their hearing acuity. Over half the patients in this series, under thirty years of age, have what I call intermittent deafness. One should pay careful attention to this fact, because it indicates that the ear condition is not so bad but what it can be arrested or improved, provided one is able to get the factor which makes the change in the hearing acuity. A careful examination of these cases shows that in almost all cases the reason for the change in hearing is because the mucosa of the eustachian tube becomes inflamed at times, while at other times this inflammation subsides and the tube again becomes patent. In other words, the cause of the trouble must be found in the nasopharynx. Many of these patients have diseased tonsils which set up an irritation in the nasopharynx, as explained by Emerson. Others have adhesions in the fossa of Rosenmüller which are continually interfering with proper muscular action of the eustachian tubes. Others have definite abnormalities in the nose, particularly hyperplastic or suppurative conditions of the nasal sinuses. But by far the majority of them have a polypoid condition of the posterior tips of the inferior turbinates which act directly on the tubal orifice. Some of these polyps are small but hang directly into the tube itself, while others are so large that they block off the nasopharynx completely. Since the examination with the nasopharyngoscope has become a routine procedure in our office we have been surprised to find that polypoid tips of the inferior turbinate are present in nearly

75 per cent of the adults who come to us complaining of deafness, particularly of the intermittent type. I cannot too strongly emphasize this point. Moreover, as will be shown later on, it is surprising in how many cases the hearing has been improved after these tips have been properly attended to.

After trying numerous classifications of cases, we have decided that a clinicopathologic classification is the best. By this I mean that the clinical evidence of the condition, as evidenced by tuning fork tests and symptoms, is joined to the pathologic evidence as shown in the middle ear and nasopharynx. In former years, the general term O. M. C. C., was used, which meant nothing. Today it is necessary to differentiate the various types of progressive deafness with which we commonly come in contact. We have found it satisfactory to place our patients in one of the groups about to be mentioned.

1. Retracted drum with stenosed tube.
2. Retracted drum with open tube.
3. Slightly retracted drum with a tube which intermittently opens and closes.
4. Slightly retracted drum which, on vibratory massage, shows only slight loss in motion.
5. The relaxed ear drum, associated or unassociated with a retracted drum.

6. Rare cases, such as otosclerosis and nerve deafness.

1. Retracted Drum With Stenosed Tube.—A large percentage of cases come in the first class. At no time is the tube open unless it is forced open by the passage of applicators or bougies. These cases cannot be Politzerized and seldom can be benefited by catheterization.

2. Retracted Drum With Open Tube.—A small percentage of cases belong to this class. The deafness is associated with an atrophic condition of the mucosa of the nose and throat, which extends up through the eustachian tubes into the ears. The retraction, in parts, may be associated with a relaxation of the drum. In other cases the drum is held rigid, due to the marked infiltration with connective tissue and the ankylosis between the articular joints.

3. Slightly Retracted Drum With a Tube Which Intermittently Opens and Closes.—By far the majority of patients

under thirty years of age belong to this class and can be benefited by proper treatment. The amount of retraction is due to the negative air pressure in the middle ear and is most often secondary to some condition in the nasopharynx. When this is overcome and the tube dilated, the drum can be readily massaged and the excursions are about normal. One has to watch these cases carefully, because any acute inflammatory condition of the nose and throat immediately shows its effects on the hearing acuity.

4. Slightly Retracted Drum, Which, on Vibratory Massage, Shows Only Slight Loss in Motion.—In a goodly percentage of cases, examination with the otoscope, attached to a vibratory massage apparatus, will show almost normal excursions of the drum. There may be a few adhesions which hold the drum down in places, or there may be a slight thickening of the drum in certain parts. The ossicular joints seem to be freely movable. It is important to recognize this class of cases, for it is in them that vibratory massage, if done with intelligence, will do so much good. Almost always there is an associated condition of the eustachian tube which needs attention.

5. The Relaxed Ear Drum, Associated or Unassociated With a Retracted Drum.—In numerous papers in the past I have spoken of the relaxed ear drum, which gives rise to what I have popularly called pocket handkerchief deafness. This class of cases has a definite syndrome. With every act of blowing the nose the patient has been in the habit of inflating his ears. He has made himself deaf by overinflating his ears, and his ears are peculiarly sensitive to all vibrations, whether they be sound or not. A very large percentage of cases that were originally called O. M. C. C. belong in this class. They must be recognized, because they are the cases which should be left severely alone unless one feels that it is worth while to attempt to tighten up the ear drums. Sometimes the relaxation is in certain parts of the drum only and is accompanied by a retraction in other parts due to adhesions between the drum and the internal wall of the middle ear or between the ossicular joints. A definite diagnosis of this clinicopathologic entity can readily be made by means of the nasopharyngoscope and the otoscope.

6. Rare Cases, Such as Otosclerosis and Nerve Deafness.

—No better evidence of the rarity of true nerve deafness can be given than by an analysis of these cases, which shows that there were only three cases of nerve deafness out of five hundred patients examined. All three were syphilitic in origin, or at least in all three cases there was a history of a previous syphilis. I do not wish to assert that all cases of nerve deafness are due to syphilis. There are other factors, such as meningitis and systemic infections. Yet, having heard so much about nerve deafness, I am rather surprised to find that there were only three cases in this series. And what is equally as surprising to you perhaps, I have not seen one case of otosclerosis that I could diagnose clinically. It is about time that we restricted the term otosclerosis. It is used too loosely and has become a byword in the mouths of the deaf with the result that a great many patients who are told that they have this condition give up in despair and become hopeless dependents. Not having seen a case of otosclerosis in over five hundred cases of deafness makes me feel that the condition is very rare, and this is further corroborated by the statements of investigators who declare that a very minimum percentage of cases of deafness examined pathologically after death show the lesions of otosclerosis.

Improved Methods of Examination.—Our conception of the pathologies of progressive deafness has expanded considerably since the introduction of more precise methods of examination. The cursory examination of the ear drum with an ordinary speculum and the examination of the nasopharynx with the small rhinoscopic mirror will not suffice. There are three new essential instruments with which the otologist cannot get along without—the Holmes nasopharyngoscope (a great improvement on my original instrument, the pharyngoscope), the electric otoscope with attachments for pneumomassage of the drum, and the various applicators, sounds and bougies, the best of which are patterned after Yankauer's instruments. In the earlier cases of this series we did not have these valuable instruments to aid us in diagnosis, but now that we use them as a routine procedure it is hard to believe that we ever got along without them. Direct inspection of the eustachian orifice is of most importance, and we

are amazed at the amount of information we derive from this examination. The otoscope allows us to ascertain the exact excursions of the ear drum, which is of equal importance. The determination of the character of the mucosa of the eustachian tube can only be properly determined by the passage of applicators, sounds and bougies through it. The information that can be derived from such a procedure I described in a paper read last year before our State society.

Value of Tuning Fork Tests.—Tests of hearing acuity by means of tuning forks as well as by the watch, whisper and spoken voice are a part of our usual procedure. But the more I have recourse to such examination, the less value I place upon it. Not for one moment would I give up these tests in order to differentiate the kind of deafness that is present or in order to make comparative observations, but the personal equation enters into the tests to a great extent. But what is of most importance, the amount of improvement which the patient derives from treatment cannot be measured by instruments but only by his own interpretation of the amount of improvement that has taken place. I am not as anxious to know whether my tuning forks show any improvement in my patient's hearing as I am in knowing whether he feels that he is hearing better in the practical everyday life that he leads. In analyzing this series I find that in many cases the patient thinks that he hears better, although my technical examination shows no improvement. A considerable number of these patients have stood by me for years, and they are content that I can keep them from getting worse. From my own personal point of view, I am not satisfied, but the patient is and that is what counts in the end. There is no instrument that I know which is an accurate test of hearing at the present time, unless we accept the audiometer, which Dean has written of in a recent issue of the *Laryngoscope*.

Prognosis.—The cases in this series divide themselves into two classes: patients who are moderately deaf and in whom there is some hope of improvement, and cases that are hopelessly deaf from the medical point of view. More of the latter class are consulting me year by year, perhaps because the otologists of the country are using me as a court of last resort. Mental reconstruction of the deafened is becoming

more and more the duty of the otologist, and this latter class can be handled only in that way. The prognosis, therefore, depends upon the type of case one is treating. I believe that the results I am beginning to attain in the mildly progressive type of case means a great deal for the future. I know that I am getting better results than I did as short a time as three years ago. I cannot help but feel that the future is full of promise if the otologists of the country will delve into this problem with the same thoroughness with which they have handled all other problems in their field. First of all, the prognostications of the future will depend on how much educational propaganda can be spread about so that the proper preventive measures in early childhood will be used. Secondly, otologists must be impressed with the fact that a proper clinicopathologic picture must be revealed before any attempt is made at treatment. Thirdly, we must get away from the time worn idea that inflation of the ears is the only treatment. The prognosis of the so-called hopeless cases will depend upon our ability to make these patients take up lip reading at the earliest opportunity. That is the salvation of these patients.

Treatment.—It will not be my purpose to outline any definite treatment as the result of my careful perusal of these cases. The most important thing to my mind is that I have become more and more convinced that the only hope of relief lies in the proper attention to pathologic conditions of the nasopharynx which exercises any influence on the eustachian tube. Tubal patency is of the utmost importance and must be permanently, not temporarily, established. Having assumed that everything of an ameliorative nature, be it operative or otherwise, has been attempted, there is often still a degree of inflammation at the orifice of the eustachian tube or in the tube itself which must be overcome. After having tried every kind of medicament we have come to the conclusion that the high frequency current, properly applied, does the most good. The ultraviolet ray may be applied by direct vacuum tubes, or one may use the modified nasopharyngoscope which I have recently had made, into which can be fitted a fine electrode for fulguration. The vacuum tubes are made on the same lines as a eustachian catheter, and are wound with silk ribbon which is coated with shellac so that if they break in the nose

no harm will be done. They are inserted into the orifice of the eustachian tube and the current is applied directly for from five to ten minutes. The results are very gratifying. After one to two treatments the tube remains open and stays open for a considerable length of time. We have treated about fifty patients in this way during the past six months, and in many instances the hearing has been markedly improved without making use of dilators in the tube of any kind. The fulguration treatment is of particular value in those cases in which polypoid tips of the inferior turbinates are overhanging the eustachian orifices and where there are evidences of glandular excrescences on the promontory of the tube, in the fossa of Rosenmüller or in the mouth of the tube itself. The current is applied in the same manner as when one desires to get rid of a growth in the bladder. As the fulguration is performed under direct inspection no harm can be done.

What conclusions can be arrived at as a result of an analysis of this large number of cases? Surely we must feel that the results are not very gratifying, as far as cures are concerned. But the future is full of promise. First and foremost, we must classify our cases in a different manner than we have in the past. A clinicopathologic classification must be established, as it seems almost hopeless to get at a pathologic classification by itself. Secondly, we must pay more attention to the etiologic factors in childhood and recognize the fact that most of the harm is done before it is discovered, and therefore be able to instruct parents and family physicians more carefully. Thirdly, we must separate those cases for whom something can be done medically from those for whom nothing can be done medically, and give these patients the benefit of our honest advice. It is a sad commentary on our treatment in the past that we have so many hopelessly deaf patients who have to resort to lip reading to overcome their handicap. Lastly, the newer and precise methods of diagnosis and direct treatment which we feared to use until a few years ago have become common knowledge and encourage us to feel that in the course of time we shall be able to treat these patients with intelligence and be able to give them honest encouragement.

2178 BROADWAY.

LVI.

CERTAIN OBSERVATIONS IN RELATION TO THE SURGERY OF THE SPHENOID SINUS.

BY B. N. COLVER, M. D.,
BATTLE CREEK.

Introduction.—About ten years ago opportunity was afforded to observe a very puzzling case in the clinic of a well known internist. This patient was seen by a number of consultants, but the diagnosis was established only at autopsy. It was abscess of a sphenoid sinus with meningitis. At this time I was also fortunate to be able to study with Skillern. He was then working on the material for the first edition of his excellent book, "The Accessory Sinus." Ever since, the lure of the sphenoid sinus has been persistent and insistent. This interest has been stimulated by the writings of Skillern, Sluder, Loeb, and others. In our own clinic we have been struck with the more than occasional case in which the sphenoid sinus seemed to be the site of persistent pathology. In many cases of multiple sinusitis it is inevitable that the sphenoid should participate. Shambaugh¹ reports a case of acute abscess of one sphenoid sinus in which the posterior ethmoid cells were also involved. He remarks that infection restricted to the sphenoid sinus in which other nasal accessory sinuses are not involved is rather the exception. In this he evidently refers to the acute cases. But in not a few chronic cases, where either in our own clinic or in other clinics the pathology of septum, middle turbinates, and other sinuses had been either corrected or excluded, the patient continued to suffer with obscure symptoms apparently of nasal origin. Persistent nasopharyngitis, lateral pharyngitis, recurrent rhinitis and indefinite aches and pains in the head without evident cause led us more and more frequently to suspect the sphenoid sinus. The recognition of the more severe cases by the obvious clinical picture invited us to seek the milder and less clearcut ones. Further, the conclusion was reached that it is just as logical to expect a residual infection of low grade in one or both sphenoid

sinuses after an intense rhinitis, as it is to look for the same in a maxillary or frontal sinus. Each spring brings its aftermath of chronic cases, secondary to the neglected acute rhinitis cases of the winter.² In many of these the ethmoid labyrinth may have recovered completely from the acute infection and the general nasal mucosa look normal. Remaining, however, there may be a frontal, a maxillary, or a sphenoidal relic with the more or less indefinite mild chronic course. It is to the surgical care of such sphenoid cases that these observations are directed.

THE SUBMUCOUS SPHENOID SINUS OPERATION.

Surgical Procedure.—The surgical procedure that has been followed in the later of these cases consists in a submucous resection of the nasal septum, with the removal of considerable of the anterior wall of the sinuses down to the lower angle, and when possible even a bit of the floor of the sinus. The septum between the sinuses may be partially or completely removed as indicated by the pathologic condition present.

When the septal operation is carried far back the vertical plate leads to the sphenoidal crest. This is covered below by the anterior portion of the base of the vomer, under which it runs into the rostrum of the sphenoid. The alæ of the vomer, anteriorly, spread laterally to cover the inner borders of the sphenoturbinals. After the crest is reached the mucous membrane over the anterior surface of the sphenoid is elevated, thus giving wide exposure of the field. Slits are next made in the thin bony wall of the sinuses between the crest and the sphenoturbinals. These slits may be continued downward into the thinner borders of the alæ of the base of the vomer. Occasionally this may be done and the anterior bony wall of the sinuses removed without lacerating the sinus mucosa. The only difficulty arises from the varying anatomy and relations of the sinuses to each other.

After the slits are made forceps may be slipped astride the upper portion of the crest, which is removed as far as the base of the vomer. Considerable difficulty is experienced if an attempt is made to remove the crest without first delimiting and partially freeing it as mentioned. The removal may be continued downward to insure good exposure of the anterior

wall of the sinuses and of the floor as well. This includes the biting away of the anterior portion of the vomer back to the rostrum. The especial advantage of this is to obviate the leaving of a lip or retaining wall at the floor of the sinus. This clean removal permits the chimney action during inspiration, described by Canfield, in relation to the maxillary sinus. In his operation he urges the removal of the deepest portion of the median wall for this purpose. The anterior inferior angle of the sphenoid sinus, while not acutely angulated, often presents a sort of reservoir or cupping. This lays it open to suspicion as an area of persistent pathology, as pointed out by Denker, in relation to the anterior superior angle of the maxillary sinus.

In the course of the operation we have found occasion to correct middle turbinate pathology also by such procedures as infraction and proper placement of turbinates in relation to the straightened septum and correction of the so-called cystic middle turbinates. The first step with such a cellular turbinate is to plunge the angle knife into the center of its anterior end. The contained cell is thus punctured. The blade of the scissors is now introduced and the incision continued inferiorly and posteriorly, and superiorly and posteriorly to the extent of the cell. A snare is slipped over the lateral half of the split turbinate and that half thus removed slightly back of the posterior end of the cell. This reduces the lateral diameter of the turbinate from 60 to 75 per cent without diminishing the area of mucous membrane and with a minimum area of surgical wound. The remaining median shell may be squeezed or compressed by a flat forceps and inflected, and thus straightened, moulded, and placed to best advantage in relation to the new septal plane. This also facilitates the inspection and work upon the anterior sphenoidal wall.

After the bone work is complete and the turbinates are inflected, the mucous membrane of the anterior walls of the sphenoid sinuses may be removed by knife, forceps and scissors. This is done through a long nasal speculum that gently presses aside the septum and the posterior end of the opposing turbinate.

The after-care is the after-care of the submucous resection. A light gauze packing is used for the septal flaps, but not car-

ried far back in the nose. We have not packed any sinus. In some of our cases the Lynch septal splints have been used.

In two or three cases the thickness of the lower portion of the bony sinus wall has made a bone biting forceps inadequate to remove as low as desired. A chisel has been held with the edge vertical or at right angles to the floor of the sinus, and two or three nicks cut into the heavier bone. After this, gentle rocking of the demarked fragments easily removes them. In one case considerable bleeding was encountered but it was not serious. The sinus mucous membrane is pushed aside rather than lacerated. Only at the conclusion of the bony operation is the nasal mucous membrane removed overlying the sinus, and finally the sinus mucous membrane itself correspondingly trimmed away.

No irrigation or antiseptics have been used in the sinuses. The rhinorrhea cerebrospinalis noted by Skillern has not been observed.

In opening these sinuses we have found mucus varying from nearly clear to decidedly purulent. We have found the mucosa apparently normal after being wiped out and have found it congested, swollen and thickened in local areas.

Cavanaugh reports one of his cases in which the opening of a dry sinus was followed by the immediate relief of a long continued pressure. He believes this to have been a vacuum sphenoidal sinus.

Classification.—In diagnosis and decision, the classification given by Skillern³ has been followed.

1. Acute Inflammation.—These cases are incidental to acute nasal infections and are not surgical. Under proper care practically all of them should resolve.

2. Chronic Catarrhal Inflammation.—This is the mildest, most common and least recognized form of sinusitis. Its history and symptoms are persistent pharyngitis sicca, pharyngitis lateralis, postnasal discharge, fullness and dryness in the nasopharynx and hawking and rasping of the throat in the morning. It rarely becomes frankly purulent or shows marked exacerbations, but continues about the same indefinitely.

3. Chronic Purulent Inflammation.—In this form the mucosa is infected in local areas, some portions being more or

less healthy. The characteristics of this type are remittent. There are exacerbations with pronounced symptoms, such as profuse discharge and typical headaches. During the quiescent stage the symptoms abate, but there is always some postnasal discharge, dull headache, and an extreme tendency to "catch cold."

In both of these chronic forms Skillern advocates his conservative operation. In this operation the normal nasal structures are almost undisturbed. It would appear that these cases are also quite suitable for the procedure outlined herein, especially when the anatomic conformation of the septum and turbinates calls for correction. The microscopic examination made of tissue taken at autopsy from the sphenoid sinus by J. D. Cowie and J. S. Fraser (quoted by Cavanaugh) shows that slight catarrhal changes in the mucous membrane were often found, but genuine suppuration was rare.

4.—Chronic Purulent Inflammation with Permanent Pathologic Changes in the Mucosa and Underlying Bone.—These cases are more severe or advanced cases and more rare than the other two. They are the typical sphenoidal empyema of the textbooks. All the classical symptoms appear and are marked. There are headache, mental symptoms, cacosmia, marked postnasal secretion, sore throat, hoarseness, disturbances of bronchi and stomach and ocular symptoms. From such cases we believe the sphenopalatine ganglion syndrome may often arise. These are the cases of hyperplastic sphenoiditis described by Sluder. They probably result from long continued irritation of the cavity. If diagnosed in the early stage and properly handled they would never develop into this type, and many cases of ganglion symptoms could be avoided.⁴ It was for such chronic cases that sphenoid surgery was first utilized and the radical intranasal operation devised, as described by Hajek. Inasmuch as the posterior ethmoid cells are usually involved, it would seem that the radical operation is the one of choice.

5. Mucocoele.—Such pent up collections of mucoïd material are more or less rare. Skillern advises the radical operation, but it would seem that the submucous sphenoid operation would be justifiable, at least as the first attempt, in any case with deviated septum.

6. Pyocele.—This collection of pent up pus resulting from a sudden closure of ostium or an acute infection of a mucocele, is indeed a rare incident. It is, on the other hand, a very grave condition and is probably the class to which belongs the case noted above. A prompt and radical operation is indicated. It is likely that the packing, congestion and edema incidental to the submucous operation would negative even the trial of the same for such cases. In such a case presenting marked septal deviation the operation might be carried to the removal of the sphenoid crest and then completed outside the septal flaps. This would mean the removal of the mucosa overlying the anterior surface of the sinus before the bone wall was attacked. Further, the more virulent nature of the pus would lead to the possibility of a complication of healing of the septal flaps. In none of the cases performed for sinuses of suitable type has there been any complicating infection or trouble with septal healing.

Examination.—Cavanaugh⁴ suggests that "Compared with the general interest in the other sinuses, the attention given to the sphenoid sinus is slight, due, maybe, to the fact that it is harder to reach and examine. It is of greater importance, due to closer association to vital structures, and when affected is more liable to complications."

Loeb⁵ says "that we do not know why the sinus should escape infection when every necessary condition is present so far as our knowledge goes; at any rate the opportunity is abundant, the attack is rare." It is a question whether the attack is really as rare as this would indicate. Surely the incidence of the chronic cases does not coincide with infrequency of acute infection. The violent or obstructed cases fortunately enough are rare, but the mild and moderate cases are common.

The history of these cases, together with the negative findings in the anterior two-thirds of the nose, has been of greatest value in the diagnosis. The tentative diagnosis may be made by a careful study of the clinical course and by elimination of the sinuses of the anterior series.

Cavanaugh states his indications for a careful sphenoid research to be postnasal dripping, obscure cases of tinnitus aurium, headaches, obscure eustachian tube infections, post-auricular pains without special local findings, pressure back

of the eyes and tenderness of the eyeball. He also suggests that, "It is possible that many disorders of the pituitary body are secondary to the primary disturbance of the sphenoid sinus. Dr. Cushing in his book on "The Pituitary Body and Its Disorders," states that it is not unusual for patients to mention an occasional unexpected and intermittent discharge of mucus in the pharynx. Dr. Cushing would lead one to infer that this is the result of the diseased gland, but it is a question whether the sinus pathology may not precede."

Anterior rhinoscopy is usually of no conclusive value. Especially is this true if the septum is deviated to any extent and the middle turbinates more or less crowded. Occasionally the mucosa in the region of the anterior sphenoidal wall may be seen and redness, swelling or discharge noted. In the wide open nose such inspection is relatively easy, though the incidence of sphenoid disease is correspondingly less frequent.

Posterior rhinoscopy, with particular attention to the lateral folds of the pharynx and vault of the nasopharynx, gives more evidence of value, especially after the sinuses of the anterior series have been excluded. In particular, the nasopharyngoscope (Holmes) is of greatest value. By cocaineizing the inferior meatus only, the nasopharyngoscope can be freely used and yet the suspected field not altered by the medication. By this means pathologic hyperemia, edema, mucus, mucopus, pus or polypoid degeneration can be detected, especially if several observations are made at different times of the day and at intervals during the same visit. One very marked and frequent finding is the irritative thickening of the septal mucosa opposite and extending down from the sphenoethmoidal angle. If only one method of examination were permitted the nasopharyngoscope would be the one of first choice. We have not tried the hand burr, as suggested by Grayson,⁶ as the repeated use of the nasopharyngoscope has given the equivalent diagnostic information.

The X-ray examination has not been of great dependability in these cases. This is due partly to the difficulty of separating the sphenoid sinuses from the posterior ethmoid cells in roentgenologic study. A greater factor, however, is the likelihood of no alteration in the density of the tissues to the X-ray.

Loeb⁵ states that "roentgenography has so far been of little value in the diagnosis of sphenoid empyema."

Iglauer⁷ has found that "the roentgenogram is a great aid to diagnosis and should be combined with careful clinical study." In this he agrees with Law,⁸ who says, "It is necessary to know the history, symptoms and the clinical findings before attempting a diagnosis."

Jervy⁹ also agrees that "as a matter of preference, I would not be without its aid, for it often adds weight to the positiveness of the diagnosis." In a case of primary tuberculosis of the sphenoid Kernan¹⁰ reports marked clouding.

Shambaugh¹¹ reports that "transillumination and the X-ray were of no particular value in the diagnosis of sphenoid sinus trouble in an acute case, "but in an abscess of one sphenoid sinus "the evidence was of definite value."

Cavanaugh probes the ostium, dilates with bougies and then uses a small transilluminator. The most he expects from transillumination, apparently, is anatomic information.

The examination of the fundus is always to be made, though only of corroborative value. There is nothing pathognomonic or constant. After studying a considerable number of proven cases, Dr. L. V. Stegman epitomizes the fundus findings as follows: "Sometimes the picture is that of a mild optic neuritis. The disc is usually slightly blurred, the margins of the papilla and retina 'fusing.' The vessels show only slight change, if any, the veins being slightly darker and broader, and maybe a trifle tortuous. There is also contraction of the color fields, especially for red and green, and the blind spot may be a trifle enlarged."

Other Treatment.—Most of these cases being essentially chronic, have had previous treatment, and many of them have had nasal operations. For a long time we have tried various methods, such as vacuum treatments, corrective surgery to the septum and turbinates, vaccines, general therapeutics, as regulation of the diet and of the gastrointestinal tract, and other measures looking toward the improvement of constitutional vigor. Cases which do not show marked improvement within a few weeks are unlikely to yield short of sphenoid surgery. Some cases have been advised climatic change, and in the milder ones, where the other nasal pathology has already been

corrected this has been very satisfactory. In some cases, however, the return to the northern climate, with the changeable seasons, has been followed within a relatively short time by a recurrence of the annoying symptoms. In some of the catarrhal cases where a definite diagnosis of sphenoid disease could not be made, the surgery has been confined to the correction of septal and turbinal pathology. Turbinates that have been in contact with or in close proximity to marked septal deviation have been thus relieved from such a relation. The vicious circle of turbinate hyperemia and edema, irritating pressure against the irregular septum and retained secretions has thus been broken. In the course of a few months the condition of the turbinates has been wonderfully improved. With this the irritation in the sphenothmoidal angle has subsided. Whether or not these were true cases of sinus catarrh is not easy to say.

SUMMARY.

During the past year fifteen cases have been found where the sphenoid pathology and the irregularities of septum and turbinates have seemed to indicate this operation.

In these cases, where septal irregularity intervenes, this can be corrected, and the further work on the sphenoid sinus adds but little to the operation. If a radical operation should be done later the septal work of the first operation would be a help or step toward the second.

The pathology of the middle turbinates is corrected, and yet the turbinate preserved. No functionally necessary tissues are destroyed.

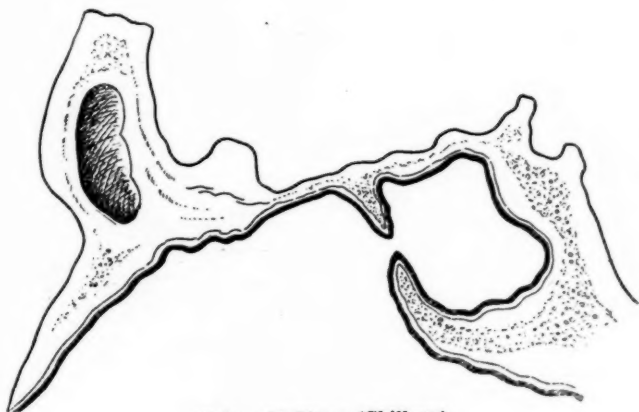
The technic permits of free inspection of the depths and angles of the sphenoid sinus.

The anterior wall, and especially the lower angle, may be removed freely and recovery thus insured.

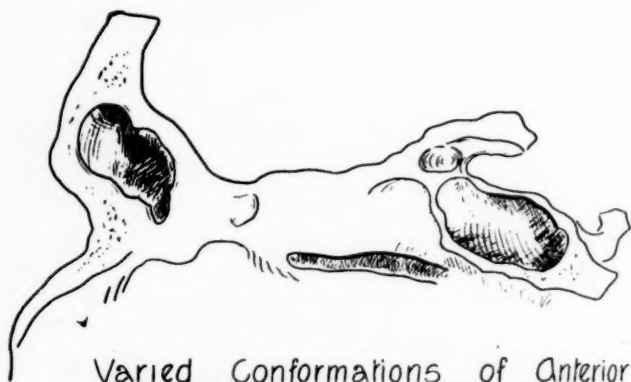
In the nose with straight septum and a free view, either the conservative operation of Skillern or possibly an exploratory opening as suggested by Grayson is indicated. Skillern points out, however, that some cases otherwise suitable for the conservative operation may not be done when the anatomy of the septum and superior turbinate results in a mere slit. Such cases would not contraindicate the submucous sphenoid operation but rather would be entirely suitable for the same.

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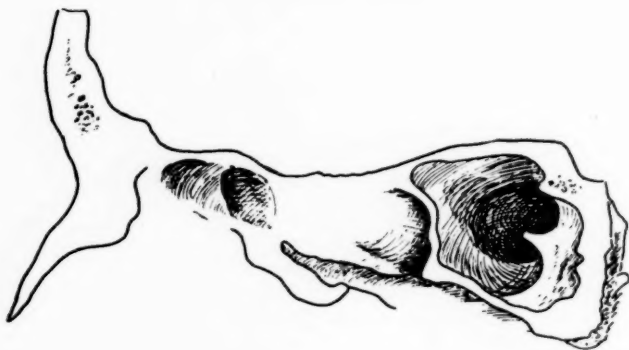
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Sphenoid Sinus (Skillern)



Varied Conformations of Anterior-
Inferior angle of the Sphenoid Sinus.





Separating the Sphenoidal Crest



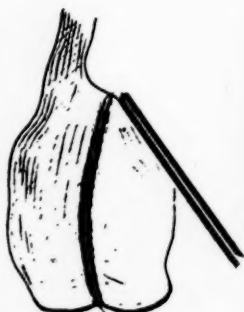
The Sinus Exposed



Puncturing the Cystic Turbinate



Splitting the Turbinate
with Scissors



Placing Snare



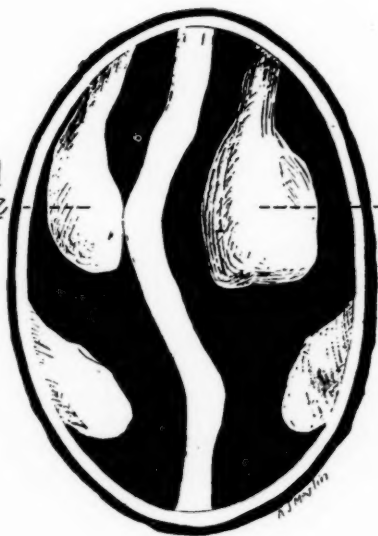
Turbinate
after
Splitting



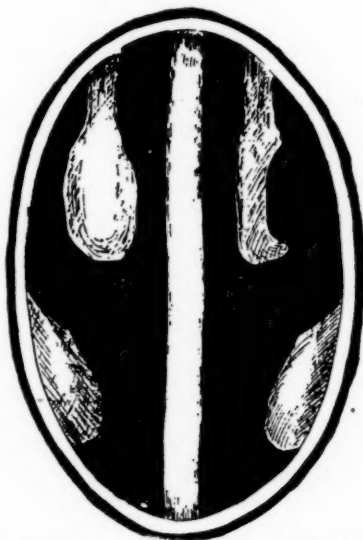
Removed Portion



Crowded
Turbinate



Cystic
Turbinate.



Septal and Turbinal Relation Corrected

LVII.

POSTOPERATIVE TREATMENT OF BRAIN
ABSCESS.*

By S. MACCUEEN SMITH, M. D.,

PHILADELPHIA.

I should like to call the attention of my hearers to the fact that I have been restricted to the postoperative care of brain abscess and am not expected to consider any other phase of the subject. Obviously, however, some brief statements of fact are necessary to elucidate the text.

In all cases of otitic encephalic abscess formations, the route of selection for their evacuation should be through mastoid exenteration; this enables one to follow the avenue of infection and explore both cerebrum and cerebellum; furthermore, it avoids the necessity, in most instances, of various trephining operations, which expose the dura and underlying structures to infectious influences, and actually do not always provide efficient drainage in the sense of a gravity outlet.

A cerebellar abscess is best evacuated via the posterointernal wall of the antrum. This triangular space is bounded in front by the posterior semicircular canal, behind by the lateral sinus, and above by the superior petrosal sinus, and this area is well exposed by the radical mastoid operation.

As superficial abscesses are usually the result of disease in the posterior mastoid cells and are directly beneath the tentorium and close to the outer surface of the lateral lobe, in hunting for a superficial abscess, therefore, we explore from behind the lateral sinus, whereas we may begin our explorations in front of the sinus to search the cerebellum for deeply seated abscess formations, which are usually the result of labyrinthine involvement and are mostly found in close proximity to the internal auditory meatus.

Should it be deemed advisable to make a counter opening

*Read at the annual meeting of the American Otological Society, at Atlantic City, N. J., June 1, 1921.

through the squama, the location for the same can be readily determined after the abscess cavity has been located through the tegmen. In such instances it is conceivable that irrigation might be employed to advantage.

In cases of unencapsulated abscess, the brain forceps is to be preferred. Personally I have not had any difficulty in entering an encapsulated abscess with this instrument. The opening can be enlarged very readily with a minimum of disturbance by gently separating the blades.

At the time of the first packing, great care must be exercised to manipulate the brain substance gently and just as little as possible. When a drainage tube is used and allowed to protrude, considerable damage may be caused by placing over it flat dressings. Indeed, I have seen several cases where this has been done progress well for a time, but finally develop some complication, which I attributed to this undue and unwise pressure. It is much better to place a quantity of loose gauze packing at the outer end of the drain.

Some operators get good results by the use of one or preferably two tubes. The cigarette, rolled rubber or gauze drain is used with equal efficiency by other men. Whatever drain is selected (I personally prefer the cigarette), care must be taken that it is inserted to the full depth of the abscess cavity. If for any reason this must be changed, everything should be ready to introduce a fresh drain to the full depth of the cavity immediately on withdrawing the original one. In the case of a child in which I evacuated an abscess from three different parts of the brain, I used for each operation—they were about two weeks apart—a double cigarette drain. In this particular instance the drainage was ample, the patient making a complete recovery, having been employed in a responsible position since her recovery, about seven years ago.

In case iodoform gauze is used—and this is advisable in almost all primary packings—we should bear in mind that a continuation of its use over an extended period may cause symptoms of iodoform absorption. If iodoform packing has been used at the time of operation, and the cavity is large and the pus foul, it is sometimes advisable to replace the same by one or preferably two drainage tubes at the first dressing, and under these circumstances irrigation is indicated.

Personally I have found it necessary to use lavage or irrigation in but a few cases of brain abscess. However, if it is deemed advisable to wash out the cavity, either at the time of operation or subsequently, two tubes must always be used. The tube provided for the return flow must be of larger caliber than that used to introduce the fluid. I wish again to state that I think it unwise to use irrigation at the primary operation, for fear of disseminating the infection. I also believe it unwise to use irrigation at any time as a routine procedure, although it is not only advisable but necessary in some instances, notably in chronic cases. When, in the judgment of the operator, irrigation is called for, the more useful solutions are those ranging from the simple normal salt or boric acid solution to one of carbolic acid, bichlorid of mercury, or the Carrel-Dakin solution, the selection being governed by the virulence of the infection.

If the opening into the abscess is sufficiently large, intracranial pressure, under the stimulus of gauze packing, can be depended upon to empty the cavity of its secretion and necrotic tissue. If irrigation is used, the fluid should be under low pressure and, as above stated, ample provision is to be made for the return flow.

The Whiting encephaloscope is useful for exploring the cavity after the abscess has been opened, and also for the repeated introduction of gauze into the cavity in suitable cases, as it reduces to a minimum trauma or disturbance to the brain substance. Another efficient means of promoting drainage, and one which causes but little disturbance in selected cases, is the introduction of the finger into the abscess cavity at each dressing, until the discharge materially decreases. Finger explorations are especially indicated if symptoms of imperfect drainage become manifest.

I have not had any personal experience with Mosher's copper wire gauze drain nor the British Army drain, but the principle is sound. It is claimed that they provide efficient drainage when combined with the use of glycerin, which softens the necrotic brain tissue and facilitates its escape with other débris.

It would seem that the character of the permanent drain must be decided almost wholly by the operator according to

the findings in individual cases. There are objections to the prolonged use of rubber tubing because the beating of the intracranial vessels against the same tends to destroy the parenchyma, and yet practically all of our early cases were treated in this manner, with a creditable percentage of success. If we felt quite secure in following Macewen's custom of removing the drain in twenty-four to forty-eight hours, then the above objection would be overcome and the rubber tubing drain would be ideal. However, most of us would exhibit the vacillation of a doubting Thomas anent the abscess cavity having been rendered thoroughly sterile—a requisite unconditionally essential for the fulfillment of Macewen's ideal.

It has been my custom to change the dressings every day or two, or even twice daily if necessary to keep them clean. The patient is more comfortable by following this procedure, and I am a believer in keeping the wound free from accumulated débris. Furthermore, I think it aids in promoting free drainage by perhaps stimulating capillary attraction, which cannot possibly obtain with a dressing that has become dried and "dead."

The encapsulated form of abscess requires a longer period for healing through the development of granulations, and therefore must be drained for a longer time than the unencapsulated type. The drain here, of whatever selection, must be withdrawn very gradually. Only the operator's personal experience and the conditions of individual cases can determine when to abandon the effort to keep the drainage tract patulous. It is better to continue this somewhat too long than to run the chance of not having thoroughly evacuated the infectious material from the abscess cavity, as well as the tract leading to the same.

It is not my habit to make especially large dural openings, hence it has not been necessary to make an attempt to suture the dura after the draining process has ceased. Indeed, I consider this an unwise procedure in most instances, as experience has shown that there will be some escape of fluid even after the methods to promote drainage have been abandoned. Suturing the dura, under such circumstances, would be harm-

ful. The usual methods of protecting the dura from infection before and following the operation, such as walling off with iodoform gauze, etc., should be scrupulously carried out afterwards until the abscess has entirely healed and the wound closed.

If the healing of the bone opening is retarded by a hernia cerebri, an attempt should be made to correct the same by exerting pressure by means of gauze pads made in cone shape and held in position by the usual bandage. In case this does not succeed, the mass, which is mostly granulation tissue, should be excised, provided the hernia does not include the cerebellum or motor cortical region. The exposed surface is then dusted with iodoform or other antiseptic powder, and the gauze pads above mentioned continued. One of my cases presenting an obstinate hernia through the tegmen was treated in this way, with the result that the depression is barely noticeable.

I believe that on account of the seemingly necessary haste in operating, the average case of brain abscess is not properly prepared for such a grave procedure. However necessary it is to promote elimination, I deem it most unwise to resort to violent purgation, on account of its depleting effect. It has been my custom before operation, at intervals of eight hours when such time is available, to give high enemas of normal salt solution, and this is continued at intervals of four or five hours subsequent to the operation, as indicated. In the case of the child to whom I referred above, the condition was so grave that we resorted to the administration of normal salt solution intravenously. The beneficial effect of normal salt solution in such cases is truly surprising and is well worthy of your consideration. It is most important that the patient should be kept quiet and free from all annoyances, even after the serious symptoms have subsided.

As all otitic brain abscess formations are subject to recurrence, the patient should be cautioned not to engage in any activities that increase intracranial congestion for at least one year. This restriction embraces everything that enters into a well regulated life, including food, drink, recreation, amusement, mental activity and sleep, and of these an abundance of sleep is most essential.

The patient's improvement following evacuation of pus from the brain is truly astounding in some instances. This is especially shown in the way the pulse and temperature will return to normal or above, from their subnormal state, and even more noticeable is the improved mental condition, the patient emerging from a state of dulness or even perhaps a comatose state, and resuming the alertness of the normal mind and again taking interest in his surroundings, and recognizing his friends and objects, and even asking for food. The transition is amazing, and I know of no other condition where the changes are so marked, and relatively so immediate, as in those cases where the functional impairment is due to inflammatory pressure and not to necrotic destruction. The latter cases are always critical and in event of ultimate cure recovery is prolonged even to several years.

LVIII.

MONOCULAR RETROBULBAR OPTIC NEURITIS
CAUSED BY PURULENT MAXILLARY
SINUSITIS.*

By J. W. JERVEY, M. D.,
GREENVILLE, S. C.

In discussing a paper by L. A. Coffin of New York, read at the annual meeting of the American Laryngological, Rhinological and Otolological Society in 1917, on the subject of the relationship of the nasal accessory sinuses to diseases of the eye, E. S. Thomson of New York remarked that it was hardly necessary to take the maxillary antrum into consideration. Whereupon J. A. White of Richmond related a case of a middle aged lady who had a retrobulbar neuritis which was blinding her and which promptly cleared up on washing out the antrum.

At the 1920 meeting of the Midwestern Section of the Laryngological, Rhinological and Otolological Society, H. B. Lemere of Omaha recounted a case of optic neuritis which responded to treatment of the maxillary antra.

These are the only two cases I can recall or find after a hasty review of the past few years' literature which directly connect pathology of the antrum of Highmore with optic nerve pathology.

In the past fifteen or twenty years much has been said and written about ocular and orbital disease secondary to disease of the paranasal sinuses, and a few years ago the late Christian Holmes of Cincinnati even went so far as to say that he believed 40 per cent of all eye diseases had their origin in the nasal accessory sinuses. Owing, however, to the close juxtaposition, amounting almost to contiguity of the optic nerve with the posterior ethmoid cell and the sphenoid sinus, it seems to have been more or less commonly accepted that optic

*Read at the annual meeting of the Southern Section of the American Laryngological, Rhinological and Otolological Society, at Asheville, N. C., January 29, 1921.

neuritis, when due to sinus infection, is the result of pathologic changes in these posterior sinuses.

L. E. White of Boston, in a very interesting and valuable contribution read at the annual meeting of the Laryngological, Rhinological and Otological Society in 1919, reported some seventeen cases of retrobulbar neuritis, occurring as a result of infection of the posterior ethmoid and sphenoid sinuses. He gave an enlightening resume of the literature, but in no case was there any reference to the maxillary antrum in this connection. But inasmuch as a large part of the orbital floor is constituted of the roof of the maxillary antrum, it would seem to require no great endowment of genius or credulity to conceive and believe that antral infection could and does at times involve the first nerve and its environs in the orbital apex.

I am glad to be able to supplement the two cases referred to at the beginning of this paper with one of my own, seen in the fall of 1920.

Case.—Miss B. J., a country girl of 16 years, of good health and strong physique, consulted Dr. C. E. Crosby of Greenwood, S. C., in September, 1920, complaining of styes on the lids of both eyes. He found she had a high compound hyperopic astigmatism, which, upon correction, gave a best vision in the right eye of 20/40, and in the left eye, counting fingers at eight feet. (Note: It was the left eye in which vision was the worse, and this fact supplied an interesting feature of the case.) One week later the patient said she "felt something pop in the upper part of her left eye," and on returning to Dr. Crosby, he found V. R. with correction equaled 20/20, V. L. equaled light perception only. At this time blanching of the left papilla was noted and some enlargement of retinal vessels. Diseased tonsils were discovered and their removal advised.

About one week later the vision in the right eye began to fail, and various X-ray and laboratory examinations failed to reveal the cause of the trouble. In other words, a thorough preliminary study of the case had been made, when at this point I was called into consultation.

October 18. Examination discloses V. R. equals 20/200, with correction equals 20/100. V. L. equals light perception only. The field of vision of the right eye (campimeter) proved

to be severely narrowed, having central vision and only five degrees in upper and nasal fields, with about twenty degrees in lower field and ten degrees on the temporal side. The vision of the left eye was too bad to chart the field. The ophthalmoscope showed normal eyegrounds, all media clear. There was noticeable tenderness on pressure over whole of right maxillary antrum, and radiographs showed a faint cloudiness of this sinus. Transillumination by palatoorbital route also revealed definite though not marked cloudiness in this area. Right middle turbinate cystic. No discharge in nares. Large chronic inflamed tonsils and a large adenoid were noted. The history of the case seemed to indicate that the left eye was amblyopic as a result of the high refractive error, and the probable diagnosis of right retrobulbar neuritis, previously made by Dr. Crosby, was concurred in.

October 19. The right middle turbinate was resected and the whole ethmoid line was opened. No pus or granulations were found. There appeared to be no sphenoid opening in the anterior wall, and entrance was made with a Grayson burr. The sphenoid was seen to be absolutely sound and normal. The nasoastral wall was then opened and the antrum irrigated, a large quantity of pus being evacuated.

October 21. V. R. (with correction) equaled 20/70.

October 22. Irrigated antrum.

October 28. V. R. (with correction) equaled 20/50.

On October 29 the tonsils and adenoid were removed. Antrum irrigations were continued every two or three days.

November 2. V. R. (with correction) equaled 20/40, very little pus remaining in antrum.

November 4. V. R. (with correction) equaled 20/20, pus gradually disappearing from antrum.

December 7. V. R. (with correction) equaled 20/15; antrum seems to be clean. The left eye remained amblyopic.

It is true the tonsils and adenoid were removed during the course of treatment, but inasmuch as the ocular condition had shown immediate and continuing marked improvement following the evacuation of the antral pus, steadily progressing during and after tonsil operation, it seems fair to conclude that the maxillary sinus was the real atrium of infection.

LIX.

MUST IT ALWAYS BE A TONSILLECTOMY?*

BY HENRY L. SWAIN, M. D.,

NEW HAVEN.

In every community there is a large number of persons who stand in need of something done to their tonsils. In these days a conscientious operator, stressed a bit, perhaps by popular opinion, lay and professional, feels that he is negligent in his duty to his patients and colleagues if he does not always do a tonsillectomy when the tonsils are the objects of suspicion. If he is in "the swim," so much work in that line stares him in the face that he feels that he must

"Count that day lost
Whose low descending sun
Views from his hand
No tonsillectomy done."

If he is obsessed with the idea that there is no other way to meet the requirement of an honest opinion of "the tonsil menace" except to enucleate, then the above couplet is not merely slightly satirical, but really a confession of faith, his form of fanaticism.

Every once in a while one nowadays hears an echo of remonstrance, gradually swelling into a real murmur of protest, as was recently expressed to me by a wealthy lady, whose erudite medical consultant wished to give her the benefit of every doubt, and so four years ago they started to put her through a variety of "stunts" to find out the cause of her rapid heart action. The empirical surgery of the day was called into requisition—rank empiricism, she chose to term it—a perfectly just criticism of the spirit of the times. If somebody gets relief from having his tonsils out, then why not try it on everybody who has the same symptoms?

If an appendix made one person have certain troubles, why may it not do so to the next? Teeth, appendix and tonsils can

*Read before the Forty-third Congress of the American Laryngological Association, Atlantic City, June 1st, 1921.

and do make a lot of trouble. Let's eliminate them, and so we often do without much evidence of a positive nature. This removal of "organa non grata" occurs so frequently and safely in these days, thanks to the skill and wonderful technic of the surgeon and operating room personnel, that we become a bit callous and forget some sad facts. For instance, in one year of my own small sphere of activity, I know of several cases of lung abscess and all that they sometimes mean, and one death, just to settle the question of a possible connection of the tonsils with focal disease. And one in which an innocent and valued life was shortened when he consulted a stomach specialist, who advised that the teeth be removed. The dentist did some, the undertaker the rest. And this happens now and then everywhere. Is it right?

But to return to the lady. First she had her teeth out, because so many seemed to possibly be the source of trouble. Failing here, they eliminated her tonsils, a most uncomfortable, distressing and weakening experience for a woman of sixty years plus. As she somewhat naively put it, "and I am now consulting you for the sore throats which were surely to be relieved by this mild (?) procedure."

Failing again, they attacked a rectal condition as surely the cause of the trouble. Incidentally they did some local good there, although the heart still went on its merry, rapid, tantalizing way. Then they did something else—I seem to have forgotten that; failing there, she went to Johns Hopkins, where elaborate X-ray, laboratory tests and other things were done to her. She was threatened with another flight of surgery, but went home to consult her family. While seated in the train she fell into conversation with a very well known medical man, who himself had been the victim of much empiricism, and who was advised—equally empirically—to see if milk and milk products were not the cause of his trouble. They were, and he advised her to try it, and in her case they also were. If she avoids milk and milk products, except a sparing amount of well made butter, she has no trouble, and this was three years ago. Previously she had been for a long time on a purin free diet. When she contemplates, with a degree of charity which is as rare as it is exalted, what a well meaning surgery has done to and for her, she sighs, and merely says she wishes

she had her teeth back. I was only with the greatest struggle prevented from reciting to her what a wag friend of mine delights in flaunting before me from time to time,

"The lives of rich men oft remind us
Of the operations that are done
Not always because sore needed,
But because they have got the 'mon.' "

In what precedes in the history of the lady in question we see what always arouses the most violent protest in my soul—a lot of guesswork, with surgery as the potent factor. In her case, she still lives, but ought we not to labor without ceasing to arrive at more exact methods?

Are we forever to go on trying with knife and guillotine to undo the mischief done instead of ever pausing to consider the mischiefmaker? Shall we never have time when trying to put out the fire to consider ways and means to prevent its origin and spread? How much time do we, who are thus assembled to listen to discursive remarks like these, ever give to the question whence came these germs whose unwilling hosts we are? Do we sufficiently encourage by even the briefest review the patient work of the laboratory man who, if we would listen to him, could tell us much about the life history of many a germ? And might he not do more if we all went to him and helped him in his studies by giving them the human touch, so to speak? He knows now that you can take the most virulent germ and by passing it through certain cultures entirely change its characteristics. Acid-fast may become non-acid-fast and vice versa, pathogenic may become non-pathogenic and vice versa. Properly encouraged and stimulated by your broad minded personal interest, might we not learn the earlier sources of these germs and prevent them from becoming pathogenic? And would not that be the greater miracle? However, we must so far, as the result of our mental habits, ever devote our earnest endeavor to put out the fires already started, but in doing so should we not when the question, for instance, of focal disease in an adult is concerned, ask ourselves, Is there not some other way, sane and sure, to prove the tonsil either as guilty or of making it guiltless, or both, without putting all patients always through an ordeal of tonsillectomy?

For years in cases not seeming to require very radical measures I have been working with a method which has turned out to do exactly what is suggested in the last sentence. While debating whether my conclusions were worth chronicling before this distinguished body, I have learned that others, by other processes, have accomplished very brilliant results and proved to be true the very conclusions which I have drawn. The three methods which give class and distinction to this work are, first, that of Irvin Moore, in the use of caustic paste in the shrinking and actual removal of undesired and undesirable tonsil tissue, and very lately the splendid idea of using the potent X-ray, as has been done now by numerous operators, but which was first called to my attention by the articles of Wetherby, and by Murphy and his collaborators, who are working at the Rockefeller Institute in New York. And lastly, and by no means least, we are to hear from our beloved and distinguished fellow member, Dr. Delavan, of the use of radium for this same purpose. The action of the two last is similar, but in the case of the latter so simple in its application, as is evidenced by F. H. Williams,* when compared to the extensive apparatus necessary for properly controlled dosage by X-ray.

The object of all is to eliminate the tonsil as the trouble-maker, and at this point might it not be profitable to consider the question, If a faucial tonsil is projecting more morbid matter into the system than any other part of the ring of Waldeyer, what part of the tonsil does it? What constitutes the difference between the tonsil which does and the one which does not? If any one not accustomed to giving the subject much consideration will take the pains to pass a probe with a right right angled curve into any of the usual crypts of the tonsils he will be wonderfully surprised at the ease and frequency with which the probe can be made to slip under and come out through another cryptal opening. This tract leading from one to the others is usually at the bottom of the crypt, often right up against the capsule, and communicates with the bottom of another crypt or crypts.

*Treatment of Hypertrophied Tonsils and Adenoids by Radium. A Preliminary Statement. Boston Medical and Surgical Journal, March 10, 1921.

Such fistulous tracts probably come because the deepest parts of such crypts have been dilated when evacuation was interfered with by the swelling at the outlet, and the simple pressure on the intervening walls caused absorption, or when particularly virulent matter may have caused active erosion to penetrate the wall and thus make a single cavity in the depth with two or more outlets. These caves or cisterns are full of fluid matter at all times and never sterile.

It is the crypts with recesses and tunnels beneath the surface which cannot cleanse or evacuate themselves which usually constitute the threat or menace of an evil tonsil, suspected of causing focal disease. At times the more fluid parts run out, leaving the cell detritus behind, and we have a cheesy substance which, when large enough, comes out as a separate mass, quite odorous and often complained of by the patient. These masses, to my mind, are never as momentous as is the menace of the fluid stuff which preceded them. Unless actually diseased, as in tuberculosis, syphilis, cancer, which are not being considered at this point, the usual tissue intervening between the crypts of the tonsils, absorbs perhaps, but practically never in itself constitutes any threat. If it does, then every tonsil does, and there are many square inches of such threatening tissue all over the base of the tongue, tonsillar lingual folds (French), lateral columns, and posterior walls of the pharynx, and, worst of all, in the region of the vault of the pharynx, where the pharynx, tonsil, adenoid is or was. So I think it logical to say that the lymphoid tissue in itself, even when thickened and hypertrophied, constitutes no actual menace. It is only when it harbors exudate in pockets which cannot be easily cleansed and flushed out by overflowing secretions of the racemose glands, which always empty numerously and copiously, into the apex of the crypts, that it will make trouble.

Said retention areas unquestionably exist wherever the crypts or pockets communicate under the surface. Speaking as we are of faucial tonsils, we should bear in mind that they are completely delimited by a definite, firm capsule, which a wise and beneficent Providence created so that those of us who almost always operate with a snare tonsillectome, can do a neat, clean job and remove the mass in toto. This limiting

membrane is so constituted as not of itself to absorb, and during operations is penetrated, when not too much traumatized, only by the lymphatics and blood vessels.

When these pockets constitute real abscess cavities, as they appear sometimes to do, then this very squeezing to which we subject them when the tonsil is removed entirely and solely by the cold snare, must force the fluids of these submerged pockets into the lymphatics and general circulation, and once in a while it produces a severe constitutional reaction immediately following the operation. Otherwise we see this matter ooze onto the surface of every tonsil as the snare cleaves it from its bed.

This very foul secretion gets down into the blood and secretions in the throat at the time of operating under general anesthetic, and so gets into the lungs, sometimes making the much dreaded lung abscess. This possibility of forcing poisonous matter into the system constitutes my reason for invariably adhering to the plan, never, if possible to avoid it, to operate while acute inflammation renders the germ activity of all the fluids in the tonsillar crypts more potent for evil. That others have operated in the midst of a quinsy or other acute seizures with impunity by no means leads me to go against my reason, and some very unhappy results have occurred.

On account of the above mentioned facts, even when intending later to do a tonsillectomy, I like to proceed just the other way. I like to slit up all the pockets, to get rid of all known and accessible retention areas, subdue all active inflammation and then see what happens. If favorable results occur, all well and good. If not, then the tonsil is freed from any adhesion it may have with the pillars of the palate, or plica, no pockets of matter are ready to burst into the lymphatics, as well as towards the surface, and the whole tonsillectomy takes place with ease. Particularly does this line of treatment commend itself in tonsillectomy on the adult when one expects to do the operation under local anesthesia, or better still, nerve blocking.

Since I have worked in this way, a number of interesting things have come to light. First, one can frequently establish by the simple slitting beyond all peradventure, that certain focal symptoms are due to the tonsil. Secondly, one can

so successfully conduct the work as to free the tonsils of a definite menace, for example, the streptococcus viridans.

Three years ago I had a patient who for over a year had a bursitis in the shoulder, and later, after I saw her, a tender joint in the foot. She had been advised to have her tonsils removed, and the date was set. Her dentist steered her to me because she had definite pus pockets in the gums around two teeth. This pus and the crypts of her tonsils contained streptococcus viridans. She being nothing loth, even if the dentist was a bit doubtful, we went to work, he to cure the Rigg's disease, and I to eliminate the retention pockets in the tonsils. The gums and tonsils ultimately became free from streptococcus, the shoulder and the foot well, and the patient has remained well ever since. A vaccine was also used to eliminate all question.

The first treatment of the right tonsil gave immediate relief to her shoulder, and as that was before anything else was done and was greater than anything else that had previously been accomplished, there could be no question as to the relation of cause and effect. Also, vaccines alone have notoriously failed to cure these cases. I think here that the gums were first infected, and later the germs infected the whole mouth and tonsils. While I agree with you that "It takes more than one swallow to make a summer," a swallow is a swallow, "for a' that." And were this the only instance, it would be worth the chronicling, but I have observed this almost magical relief from thus simply cleaning up the crypts too many times to have any doubt in the matter, any more than when it has occurred afetr that exceedingly impressive and spectacular encounter known as tonsillectomy. That is—please observe—we have both established the connection between the tonsil and the distant disease, and cured the patient at the same time.

The recent article already referred to in the Journal of the American Medical Association for January 22, 1921, by Murphy and others working in the Rockefeller Institute, demonstrates that not only can tonsils be shrunk in size by X-ray treatment but the crypts become free from streptococci while being thus treated. My own observations are thus corroborated. Their explanation is the same as mine. The shrinking in size lessens the retention in the crypts and the germs die.

They deny any special or specific action of the X-ray on the germs themselves.

This is, however, no more, you will remember, than Dr. French has told us he can do by curettement, or, on another occasion, we were told by Dr. Delavan that he accomplished when he positively demonstrated that he could eliminate carriers of disease by his complete disinfection of the nose and throat by his method of using dichloramin-T.

As these cases of my own have multiplied and have been observed, some for perhaps ten years, I felt so sure of the matter that I was almost ready to say that I could in the above way always determine when a tonsil is or is not a menace.

A young man, directly following a sore throat, had multiple joint symptoms and was permanently invalidated. I was asked if I thought his tonsils caused the trouble. Matter could sometimes be squeezed out of them when adroitly and firmly compressed. I said I could not rule them out, but I would treat them so they would constitute no further menace. This I did, so thoroughly that I felt justified in saying that I thought I had them all right. Then he went away to a sanatorium noted the country over for its insistence that the tonsils be removed as a *sine qua non*.

They took cultures from the remnants of the tonsils, they introduced hyperdermic needles into the tissue of the tonsils and sucked the matter from the deepest accessible area, and in the end they told him "they guessed they would look elsewhere for the trouble." "Perhaps a gallstone operation or a diet would restore the youth," and they improved him by the latter.

Another instance where the tonsils must be removed. Nothing doing, unless patient complied. Slitting and clipping reduced the tonsils to a sterile mass, and the doctor was told that a complete removal had been accomplished. He was more than pleased with the "beautiful tonsillectomy," and then, at my request, as an obstinate iritis was now coming on, with further search a pus tube was diagnosed and removed. Patient is in blooming health. (I forgot to add that previous to my efforts she had many of her teeth out, and with no effect.)

Case after case seems to prove that if there is no glandular—lymph node—swelling in the neck, which always means un-

questionable absorption, and the crypts are cleansed and sterilized of any suspicious streptococci, one is justified in claiming such a tonsil is not producing evil of itself, the reason being that these treatments can be so thorough that nothing need be left which will harbor pathogenic germs.

Every once in a while one will score a failure, just as he often does when he does a major tonsillectomy, a very good argument, it seems to me, in favor of giving the weak and timid a chance to get by without the harder, dangerous work.

I have particularly in mind as I write these words, meeting on one occasion, socially, a very blooming specimen of comely womanhood. The young matron greeted me by name, and as I presume my face did not show the response she expected, she laughingly accused me of not recognizing her. Then suddenly I exclaimed, "Yes I do; but what has happened to you?" "Nothing but your own handiwork." She had some two years previously been compelled by family happenings to discontinue work which I had been doing on the tonsils, and I remember at the time that I regretted very much indeed not being able to finish up. She had been very strongly urged to have the tonsils out (as you will see, most excellent advice), but dreaded it because she was so weak and miserable. She had a lot of various things the matter with her, and there was enough glandular infiltration in the neck to make one suspicious of the connection with the tonsils. I proceeded as usual to slit up the crypts, and punch out all undermined areas, finding in one tonsil a real abscess. Although her course of treatment was only about half done, she was compelled to stop, but had already begun to improve. In spite of ceasing all treatment, she gained twenty pounds, lost her pallor, recovered her initiative, and was the transformed individual I discovered. Some weary wag will say, "Think what might have happened if the whole of her tonsils had been taken out?" That you will have to conjecture. I was perfectly satisfied with what my efforts had accomplished. Certainly no perfect tonsillectomy, by whomsoever performed, had ever done more. Some tonsil tissue remains, but the pockets are removed.

I can surely and safely affirm that this has happened so often that I know I am not taking too grave chances, that I

am never trifling with anybody's lease of life, or happiness, by suggesting it as an alternative to tonsillectomy. Please let me again state it is only an alternative, a substitute for tonsillectomy, when from choice or necessity you cannot do the more radical procedure.

The question of daring to do surely enters into a situation such as the one which follows. A lady of some forty-six summers had a most uncomfortable joint affection flitting around from one to the other, and apparently finally settled in the hands and feet, she being some of the time unable to use either, a predicament hard to beat. In addition the heart action was irregular. She lived out of town, and was brought to me a number of times to see if the simple slitting would settle the question whether the tonsils were the cause of the trouble. She was certainly the kind of a case where if one could avoid a serious operation it ought to be carefully shunned. The tonsils were small and yet what we would term suspicious, as indicated by French's transilluminator, a much too little used instrument. Nothing very serious in the way of accumulation of matter in the tonsils was found, but with no other difference in the daily routine from that of the previous months, she began to improve, and no one could possibly convince either her or me that the tonsil work did not cure her. Certainly she went through the two hardest winters of her life, the first, while undergoing treatment, where, owing to the circumstance of her husband being in Washington and her help all taken away by war activities, she did her own work at home and no end of Red Cross work, thus as you perceive having the use of her hands, feet, head and heart; and the previous winter she had been waited on hand and foot. The relief began after four treatments.

I cannot think of anything I have overlooked in making up my mind that these treatments have been the cause of the improvement noted, but in several instances, when, as a tonsillectomy itself often does, it seemed not to have relieved successive attacks of sore throat, a little more thorough treatment applied in the same way to the tonsils themselves did the trick.

Often when the work done to the tonsils seems to have failed a bit of attention to the nose and the much neglected

nasopharynx will turn the tide from failure to success. Also we have been recently shown by Dr. French of Brooklyn that accessory tonsil tissue, with well developed, massive crypts, capsule—all the elements of a middle tonsil—often exists in the region between the faucial tonsil and the lingual tonsil. This tissue he was bold enough to attack with a Sluder tonsillectome, having by his transilluminator proved it guilty of criminal possibilities if not intent.

Such conspicuous masses have been removed, so well encapsulated, so cleanly and smoothly enucleated, that one could readily pass them off as enucleated tonsils. That these can make trouble by absorption and can be made innocuous by milder measures I have successfully demonstrated this last year, and am sure this explains why, when both faucial and lingual tonsils have had their fair meed of attention, I may have failed by having overlooked this region just mentioned. This region is often forgotten, when a real hard tonsillectomy has been done, and this brings us to a final suggestion before describing the simple methods I have used in the actual work.

It is not a terrible crime, in my judgment, to have omitted a bit of lymphoid tissue. I do not believe it can be helped. In any case, the best operators in the country (which means the world), do and always will occasionally leave tissue behind if for no other reason that it is too small to see, and it later grows to take the place of the removed tonsil. Small bits are, apparently, frequently overlooked, and especially when working with local anesthesia or nerve blocking, not merely because of the pain but because the gagging, bleeding, fainting or other bad actions on the patient's part make us desist from further trial to the patient. I repeat, I consider it no crime to have thus omitted some tissue. By simple slitting and punching out, and the galvanocautery shrinking, one can later care for this tissue with accuracy and safety, and thus oftentimes avoid an injury to the palate, base of the tongue and the deep tissues of the neck, which can all too easily ensue when rapidly, at the end of a bloody operation, attempting to gather into the snare whatever small fragments it will grasp. The clean cases which do not bleed are the very ones which seldom need any extra work.

Please understand that in most of what I have said in this paper I have in mind the adult who, having had symptoms of focal disease, is having the tonsils eliminated, but it may be adapted to tonsils of any age. To young children, and the young timorous adult the best work to my mind is always done under a general anæsthetic, and naturally when one operates radically he always removes all adenoids from the nasopharynx.

And now a few words as to the method. After a thorough cocaineization of the crypts, inside and out, with a finder one discovers all adhesions with the plica and pillars of the palate and the intercommunicating crypts of the tonsil, and generously and freely opens them up, the bulk of the work being done with Leland's or similarly constructed probe pointed knives. Then with simple punch forceps bite out or off any tissue which would seem to be liable to grow together again, which will often occur when left to drop together with nothing more than a simple slitting. The tissue between the crypts often has to be snipped out so as to make the cavities cup shaped or grooved, in which condition when healed over they offer no place for retention of matter deleterious to the system. The rule of the work is to do what is convenient and easy of accomplishment on one side and a week later the other, alternating back and forth until all pockets are abolished. If the tonsil is large and the crypts and the pockets deep, one has the choice of snipping and removing the superfluous hypertrophied tissue, or one can use the electric cautery or both. In my own case both are very frequently used. When the tonsils have been thus handled they are not very sore following the treatments, and one can accomplish just as much in the way of shrinking as he chooses, so much so that one can be greeted, as I stated in one of my cases, with the remark, "What a beautiful tonsillectomy." And it was; at least there was less tonsil visible than after many a so-called tonsillectomy. Furthermore, one rarely gets serious bleeding, accomplishes his purpose without upsetting the even tenor of a patient's life, even by a hair, does not distort or amputate any portion of the palate, and if his work—as we all so carefully do nowadays—is done cleanly, almost no infection can take place. One has rarely to work more than three times on the same

tonsil—five weeks of little or no discomfort at all, as contrasted to a patient I have recently seen for the second time, who was two months getting over the effects of his tonsillectomy, forever has a distorted palate and troublesome adhesions at the base of the tongue, nearly died from hemorrhage, having to be transfused, all to prove that the tonsil did not cause his sore throats and colds. I have treated him several times since the operation, which I distinctly advised against as probably unnecessary. I say when one contrasts and, as I sincerely believe, can by the former way rule out the tonsil absolutely as the cause of the trouble, why not do it in that way, where appropriate occasion presents itself, especially when if, as before stated, the tonsil should continue to rebel, a later tonsillectomy has usually only been facilitated.

The genesis of an idea or plan of procedure sometimes is interesting, often revealing. Years ago when removing adenoids my custom was not always to rip out the tonsils, as is now done as the invariable routine. Then we did it only when the tonsils were large. When I did not remove the tonsils I formed the habit of always, with finger or instrument, liberating the tonsils from the plica and perhaps anterior pillar of the palate, and was much impressed at the shrinking in size which this produced. Later I started to do this to the tonsils in cases where I was about to shrink them by ignipuncture.

Probably I have shrunk more tonsils in this way (ignipuncture) than almost any other extant operator. Naturally, some of my cases have since been tonsillectomized, and heads wagged at the failure of the method, but no oftener than enucleation itself has failed. Since I have done the preliminary slitting, fewer cases have relapsed, and by my present method I can more often completely get rid of all bad tissue than by any but the slickest kind of tonsillectomy. I have done all of this for so many years, with careful checking up, that I am venturing to offer this as a substitute in suitable cases for the much more serious, and in adults, painful enucleation. In presenting these thoughts for your attention there is nothing new or startling in them. It is only that they represent something definite and positive, and, after all, I beg of you, do not

for one moment think that I do not deem it wise to tonsillectomize my own clientele, nor do I desire to cast any slightest reflection on the splendid work of my fellow conspirators. Quite on the contrary. I merely reaffirm that if one does not care to do a tonsillectomy for any reason, I have in this manner accomplished just as spectacular, just as wonderful, just as enduring results as I or any one else has by the major operation, and all that I have said is really in the way of emphasizing, not minimizing, the importance of tonsil work.

May I not, in closing, quote from the eminent English observer, Dr. Irvin Moore, who, as before mentioned, in the *British Journal of Laryngology*, October, 1919, writes along similar lines and suggests when, for any reason, it is deemed unwise or contraindicated to perform tonsillectomy, the application of caustic paste to the tonsils? He shows some very ingenious cup to hold the paste against the tonsil. The paste is composed of equal parts of caustic soda and hydrated lime mixed with a little alcohol. "This escharotic not only destroys in successive layers a portion of the tissue by a process of disintegration, but also devitalizes a subjacent layer, causing it to become soft and friable. During the devitalizing process the tonsil undergoes general shrinkage. The largest tonsils have been reduced to normal size, whilst in the case of diseased tonsils there has been no blocking up or sealing up of septic crypts as may occur with the galvanocautery.

Though this treatment by this escharotic paste can never be expected to take the place in suitable cases of complete removal of the tonsils by operative methods, yet experience has undoubtedly shown that it is a highly effective and valuable alternative in cases so frequently met where risks of excision have to be seriously considered or where the radical operation is refused."

Now that it has been so definitely proven what can be accomplished by these various methods, and especially by the X-ray and radium, the pendulum may be expected to swing well over to the other side of the arc, but for myself, when advising patients I shall continue to do as I have already done in numerous instances. First get rid of the main pockets and adhesions as outlined here. Then have them have their X-ray or radium treatment. This should prove to be adequate to

produce all needed elimination when it is elected as the method of choice—but, as suggested by Stewart, New York Medical Journal, January 4, 1919—it can never be expected to exceed in efficiency a clean, perfect tonsillectomy, except as the effect of the rays shrinks other parts of the Waldeyer's ring of lymphoid tissue, as well as faucial tonsils. Also it will be reasonable to expect that certain shriveled up, sclerosed and atrophied tonsils, even when presenting some considerable mass, will not shrink or be altered by the radiant activity, by whatever means administered, as will others even smaller when composed of the usual type of tonsil tissue.

195 CHURCH ST.

LX.

PERCEPTION DEAFNESS.*

BY FRANCIS P. EMERSON, M. D.,

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Etiology.—In considering the etiology of nonsuppurative deafness there have been two theories that have divided otologists into camps. First, those who have believed in the theory of negative pressure, and second, those who have believed in infection as the primary cause. Of late years the advocates of infection have been the more numerous. Judging from the treatment generally accepted by otologists, it is fair to assume that the second class have believed that deafness was the result of an acute infection that damaged the conduction apparatus and then ceased to be a factor in the further progress of the disease. The deafness was then progressive by further attacks of tubotympanic catarrh that was the result of a fresh infection. The writer wishes to take issue with this position and to claim that all deafness is the result of a deep infection in the lymphoid tissue; that the infection then exists as a chronic focus subject to acute exacerbations; that the resulting deafness does not occur from the extension by continuity of the infected tissue through the tubes and middle ear so much as it is the result of a toxin acting on the perception apparatus. That is, we have perception deafness from the beginning that can be demonstrated throughout its course until the end result, which is either nerve degeneration or perception deafness, without regard to the tissue reaction in the middle ear.

If we carefully analyze our histories of chronic deafness we find in one class that there was otalgia in childhood, and in these cases we all attribute the middle ear involvement to a blocked tube secondary to infection of the lymphoid tissue.

*Read before the meeting of the American Otological Society at Atlantic City, N. J., June 1, 1921.

Until adolescence, lymphoid tissue predominates, and beyond this period it is replaced by fibrous and mucoid elements (Jonathan Wright). With the change in structure the lymphoid tissue undergoes retrograde changes, becomes less functionally active, and is therefore more susceptible to infection. The next class of cases follow the infectious diseases and are characterized by a more virulent infection which, in many instances, results in chronic foci subject to acute exacerbations throughout life. For a long time the foci may remain as a walled off local process. If the resistance of the host is lowered, the virulence of the organism increased or necrotic tissue changes destroy the leukocytic barrier, then we have systemic complications with remote tissue reactions. Why this takes place in a particular joint, endocardium or middle ear, we do not know, but once having occurred the tissue reactions go on in the same organs indefinitely. The history clearly shows that the patient was never deaf until a certain time when he had influenza, measles, diphtheria, etc. Following this infection the deafness was progressive, and especially noticeable after acute exacerbations. Cultures of the throat show some form of virulent bacteria present in the lymphoid tissue. The vessels of the anterior pillars are injected, the tonsillar crypts contains pus, mucopus or débris. The secretions of the pharynx are changed—i. e., there is a low grade pharyngitis, and the deep cervical glands under the angle of the jaw are enlarged. With acute exacerbations of the focal process these glands are sensitive on palpation. While there is a tendency for the infection to extend to the lining of the eustachian tube with gradual extension to the middle ear, the gross tissue changes are of only secondary importance to the accompanying infection in the problem of deafness. The conduction apparatus, when considered as a mechanism for the protection of the nicely adjusted perception apparatus, is wonderfully arranged. With the tissue reactions following a focal infection due to a particular strain of bacteria in all forms of deafness, there seem to be changes in the conduction apparatus analogous to those taking place in other organs which are damaged as the result of a similar focal infection. In all cases there is a functional disturbance of the perception apparatus, and in the organ of hearing, as in other organs, the restoration of func-

tion is dependent on whether its special nerve mechanism is irreparably damaged or only functionally disturbed.

Many otologists since the days of William Meyer have recognized the importance of removing infected adenoids and tonsils. Many now recognize that adults carry infection throughout life in the lymphoid tissue with an accompanying low grade pharyngitis. It is not only necessary to remove these foci in cases of deafness, but all contributory infective areas in the teeth, sinuses or chronic mastoids, that drain through the lymphatics. In a given individual the balance between the infective agent and the natural immunity of the patient due to the bactericidal and antitoxic powers of the tissues, blood plasma and cells, varies markedly. When this balance is once disturbed by any cause that lowers the resistance of the host and systemic infection results, the remotely involved tissue becomes sensitized, and less toxin than would affect a normal individual suffices to continue the morbid process. This makes the presence of innumerable saprophytes in the mouth and pharynx and such pathogenic bacteria as the streptococcus mucosus, viridans and hemolysins, the micrococcus catarrhalis, pneumococcus, bacillus mucosus capsulatus, gripe bacillus, diphtheria and pseudodiphtheria bacilli, which may be found in infected lymphoid tissue and the sinuses, particularly, dangerous to the carrier. Furthermore, such infectious foci of the head may be associated with secondary infection of the lymph nodes of the neck and mediastinum. These patients have low resistance, and overwork is as potent in activating the focal process as is exposure. With these conditions present, and judging from the analogy of similar tissue reactions in other organs and from clinical experience, it is the conviction of the writer that deafness is the manifestation of a systemic infection resulting from a special strain of bacteria, the toxin acting on the perception apparatus from the beginning and continuing so to act until the terminal stage of marked perception deafness or nerve degeneration, the accompanying gross tissue changes in the conduction apparatus playing but a minor rôle in deafness.

Deafness may be defined as an impairment or loss of tone perception. Corti's cells are supposed to constitute the clearing house where sound waves are differentiated and conveyed

through the auditory nerve to the cortical centers. It is at the acoustic centers that wave impulses are interpreted as sound. We say then that anything that obstructs or interferes with these wave impulses reaching the perception apparatus results in deafness. Is this the true explanation? Let us assume that deafness has its beginning in infection. Now, not all infections are followed by impairment of hearing. In some cases of infection in which tone perception is impaired there is a complete restoration of hearing with the clearing up of the infection. These are the few cases in which inflation and the usual methods of treatment of the eustachian tube are indicated. There are deep infections, however, that do not clear up with the subsidence of the acute symptoms, either from the virulence of the infection, the lowered resistance of the host or poor drainage, and these infections cause most of our cases of deafness. These chronic foci may, with acute exacerbations, for a long time give only local symptoms. When the local barrier is once broken down we have systemic manifestations and but mild local symptoms. When this occurs the remote tissue reactions seem to remain constant and are further damaged with recurring exacerbations of the focal process. If the systemic infection was followed by myalgia, infectious arthritis, endocarditis or nephritis, it continues to do damage to the tissues originally involved. A joint may be involved as the result of local chemical, circulatory or traumatic causes or, as Rosenow says, because of the selective action of a special strain of bacteria. If we consider for a moment the resulting pathology in a large joint it may help us to understand the changes in the organ of hearing which are accompanied by deafness. First, there are circulatory changes followed by the pouring out of leukocytes from the blood stream and increased secretion. This is followed by the formation of new connective tissue, pressure symptoms, the absorption of cartilage, etc., depending on how far the process may go. The nerve supply shows at once functional disturbance of its sensory fibers by pain, and of the motor nerves by changes in its terminal filaments. We may cause the inflammatory products about the joint to disappear, but restoration of function depends on the integrity of its special nerve supply. Now, in the organ of special sense we see some-

what similar phenomena. With a primary infection that was accompanied by deafness each recurring exacerbation adds to the damage of the tissues originally involved. That is, if the tissue reaction was in the mucous membrane, the fibrous tissue or bone, it continues as such, and we have a progressive chronic catarrhal, catarrhal adhesive otitis media or possibly otosclerosis as long as the chronic focus is active or secondary foci continue the same type of infection. We have the same circulatory changes, the same pouring out of leukocytes from the blood stream and increased secretion with the formation of fibrous bands or the deposition of new bone. The analogy goes further, for we have at once functional disturbance of the end organ—that is, the acoustic centers and tinnitus. This occurs at once in every form of deafness. We may cause absorption of the inflammatory products in the tube or middle ear, but the restoration of hearing depends on whether the perception apparatus can be functionally restored.

For these reasons the writer has been forced to the conclusion that deafness is from the first concerned with the perception and that the conduction apparatus plays but a minor rôle. We have studied minutely the obvious gross tissue changes but have lost sight of the fact that the perception apparatus is impaired from the first and continues to lose in function throughout the course of the disease. With the loss of tone perception there is tinnitus. Hearing tests show a loss in perception for the whispered voice and also a raising of the low limits. As the blocked tube becomes open the low limits become normal, but if the process is progressive the perception for the whispered voice diminishes. The low limits are not again raised until the function of the perception apparatus is markedly impaired. With the raising of the low limits we begin to have a negative Rinne, marked perception impairment of the upper limits, and, in some cases, involvement of the cochlear nerve. The impairment of the perception for the 2048C⁴ fork is often noticed and frequently tone gaps. In fulminating cases where in a short time the membrana propria, malleus and incus are destroyed and yet the hearing remains good and may be nearly normal for years, the functional impairment of the hearing may be so pronounced that tone perception is wholly lost for the spoken voice. If this comes on

suddenly as the result of the toxic action of a virulent infection that quickly clears up, the hearing returns because the perception apparatus is not permanently damaged. Metallic instruments are of no practical value in indicating the beginning of nerve deafness. When bone conduction is lowered for the 256C¹ or 512C² forks nerve deafness has been present for a long time. Deafness results from the action of a toxin on its special end organ in constitutional diseases and also in those chronic focal infections which so many patients have throughout life. The writer does not believe that alcohol and tobacco ever cause deafness with patients who have a normal throat. Both, however, cause a pharyngeal congestion and activate the focal process in the lymphoid tissue, increasing the absorption of the virus originally responsible for their impairment of tone perception. In the same way pyogenic foci in the teeth and sinuses are contributory causes of deafness because they drain into the lymphatics of the throat. Gross changes from hypertrophic processes in the conduction apparatus resulting in increased connective tissue, fibrous bands or bony ankylosis, are of minor importance in deafness compared with the perception impairment which started with the original infection and had progressed with the more obvious tissue changes. Skilled otologists have difficulty in interpreting certain hearing tests because they try to analyze them to conform to certain types of deafness. Diminished tone perception is indicated in the same way at the beginning of all middle ear diseases, whatever the tissue reaction from a given infection. After perception impairment is far advanced in those cases involving the cochlear we make a diagnosis of nerve deafness. It is obvious that this must have been going on for a long time before nerve deafness can be detected by a metallic instrument. Tinnitus, which is the only way that the acoustic apparatus can react to stimulation or irritation, is present with the first impairment of tone perception. As we know, clinically these subjective sounds are intermittent at first, but with the progress of the disease they become continuous and change in character.

While the gross changes in the eustachian tube and middle ear interfere with the transmission of sonorous vibrations these do not come within the range of ordinary conversation.

Furthermore, the low limits clear up with the unblocking of the tube in acute conditions, even though perception for the whispered voice may be further lost. What is of more importance in the loss of tone perception resulting from a blocked tube is pressure on the stapes. While this seems to effect only sonorous vibrations and therefore is of secondary importance in the treatment of deafness, it undoubtedly is important in causing tinnitus. Now, tinnitus is another term for labyrinthine stimulation or irritation, so that pressure and toxemia seem to be important factors in the gradual loss of tone perception.

We have, then, in every deep chronic infection of the lymphoid tissue which has been followed by deafness, two ways in which its progress is manifest. First, by gross changes affecting the conduction apparatus but playing but a minor rôle in the loss of tone perception. Second, by the action of a toxin on the end organ impairing the function of the acoustic centers or, in a less number of cases, manifestly involving the cochlear nerve.

It would seem that the profound loss of tone perception in nerve deafness was due to changes in the terminal filaments of the auditory nerve rather than to changes in the cortical centers themselves. Cases of advanced progressive deafness often show a bilateral hearing test that does not vary throughout the scale. This could be explained on the ground that it is probable that the auditory fibers from each ear end partly on the same side and partly or mainly on the opposite side of the cerebrum (Howell).

Treatment.—While the writer has treated deafness on the above outline of its etiology for ten years, emphasizing the importance of infection, and failing to get results from inflation except in recent cases, the interpretation of the way in which deafness resulted has only been reached in the last few years. Obviously we remove the primary focus and all contributory foci tending to reinfect the lymphoid tissue. This makes it necessary to do radical surgery and not merely convert a chronic antrum into a latent one, or improve a pharyngitis without removing the cause above or below. Many latent antra with atrophic changes and without a pyogenic focus will still reinfect the lymphoid tissue and eustachian tube. Gross

changes in the nares have not been considered as affecting deafness unless infection was present. Submerged tonsils have been removed in adults in all ages up to seventy years whenever there was a change in the secretions of the pharynx or enlarged cervical glands under the angle of the jaw. Enlarged cervical glands following an acute infection that do not subside within a few weeks presuppose that the focal infection has not cleared up. Metabolic changes have not been considered as coming primarily from the intestinal tract but as having originated from the upper respiratory tract, as pointed out by Billings. With the removal of infection general measures are instituted to overcome the effects of a long continued toxic process. While the iodids, pilocarpin, strychnin, electricity, auditory reeducation, etc., are indicated, it is also necessary to improve the general condition. The loss of tone perception through depressed nerve states seem best treated on broad general lines. Many cases of deafness that have existed over a long term of years will improve markedly. In others the duration may be short and yet the treatment is hopeless. At present there seems to be no way of determining how far the perception apparatus is damaged or, in case of nerve involvement, whether degeneration is far advanced. Progressive or perception deafness has a most hopeful outlook if treated early and energetically when the cochlear is not involved. All patients who have had a deep infection as a result of measles, scarlet fever, diphtheria or flu should have an interval tonsil and adenoid operation as a routine procedure without regard to age. Every patient who has a blocked tube and tinnitus accompanying a so-called acute infection should be carefully examined for a definite focus which should be treated surgically before secondary foci result. After this the follow up treatment should be local and general. All cases of long standing focal infections are about 20 per cent anemic and many have cardiac and renal conditions needing general medical care. The usual methods of treatment are all indicated under special conditions. In chronic progressive deafness, until the low limits are raised, however, the two important indications are the prevention of tubotympanic catarrh by the removal of chronic streptococcal foci and the recognition that impairment of tone perception is constantly going on.

INFECTED ADENOIDS.

Case 1.—S. S., 8 years, blocked tubes, pressure on stapes; Dec. 27, 1919. Past history: T. and A. operation three years ago. Two months ago following measles commenced to be deaf. Tinnitus marked in both ears. Examination: Epipharynx blocked by infected lymphoid tissue. Sinuses: Ethmoids transilluminate poorly. Antra clear. A. D.: M. T., ground glass appearance; indrawn. L. R. broken. A. S.: Same. Hearing test:

R	W.V.	L
2/25		2/25
14	R ac	16
6	256C ¹ bc	6
64	Weber	64
	L.L.	

Diagnosis: Blocked tubes. Pressure on stapes.

Dec. 31, 1919. Adenoid removed under gas.

Oct. 28, 1920:

R	W.V.	L
25/25		25/25
32	L.L.	64

P. S.—Tinnitus persisted several months and gradually disappeared as the infection cleared up.

Treat.: No inflation. Epipharynx treated after adenectomy until infection cleared up.

Key to hearing test: W. V., whispered voice; Cons., conversation; R., Rinné ac—bc; W., Weber; U. L., upper limit (Galton whistle); L. L., lower limit (Dench fork).

Case 2.—I. B., 12½ years, B. O. M. C. C., May 24, 1919. Past history: Measles, 9 years. Chickenpox, 9 years. Whooping cough, 7 years. Has been growing slightly deaf, especially following colds. Several attacks of tonsillitis. Throat does not feel right in the a. m. Examination: B. cryptic tonsillar disease. Septum, high deviation to left. Turbinates, posterior ends of inferior turbinates markedly enlarged, especially on the left side. Hearing test—

R	W.V.	L
20/25		25/25
37	R ac	45
8	256C ¹ bc	10
32	+ < Weber	32
	L.L.	

July 1, 1919. Tonsillectomy; ether.

R		W.V.	L
15/25			20/25
20	R	ac	19
—		—	—
10	256C ¹	bc	9
32	+ < Weber	L.L.	64

March 1, 1920. Attack of mumps. Following this attack hearing less acute.

July 1, 1920. Went to New Hampshire camp for the summer.

Sept. 10, 1920. Epipharyngitis. Marked swelling of posterior ends of inferior turbinates.

R		W.V.	L
15/25			20/25
18	R	ac	18
—		—	—
8	256C ¹	bc	8
32	+ < Weber	L.L.	32

Treatment: No inflation. Treatment of infection. Sprays, normal salt solution and 20 per cent argyrol.

October 26, 1920—

R		W.V.	L
23/25			23/25
32		L.L.	32

November 16, 1920—

R		W.V.	L
25/25			25/25
32		L.L.	32

Note.—Although this patient was out of doors all summer her ears did not clear up, owing to a persistent epipharyngitis with blocking of the left posterior naris. As soon as the infection was removed the hearing returned to normal.

Case 3.—H. L., 51 years, January 11, 1916, single, American. Past history: Measles, chickenpox, scarlet fever (mild). History of abscesses in childhood. Last three or four years history of swelling in one ear and then the other. No loss of hearing patient thinks. Head colds frequent. Occipital headaches with tenderness of the scalp at times. Rheumatism

since April in knees and fingers. Is being treated for rheumatic iritis. Tinnitus continues since August in both ears. General health always poor. History of abscess in intestine and of mucous colitis. Examination: Septum to left with a large posterior basal spur. Turbinates, hypertrophic changes. Do not shrink under cocain. Sinuses, negative. Teeth, negative. Tonsils, R. shows cheesy débris. Hearing test:

R		W.V.	L
6/25			12/25
19	R	ac	19
—		—	—
8	256C ¹	bc	8
	+	< Weber	
32		L.L.	32
N		U.L.	N

Treatment: Tonsillectomy. Submucous resection. Treatment of infection. Teeth looked after.

April 5, 1917. Gall bladder operation.

Dec. 29, 1919. Otalgia dentalis.

Mar. 28, 1921. No rheumatism or iritis since tonsillectomy.

R		W.V.	L
25/25			25/25
Not taken	{ R	ac	{ Not taken
		—	
		bc	
—		Weber	—
32		L.L.	32

Note.—See history. Infection in teeth and throat followed by headache. Rheumatism, rheumatic iritis, infection of gall bladder. Deafness, cured by removing the chronic foci without inflation.

Case 4.—E. G., 8 years, Nov. 16, 1920, only child, mother and father living, L. antrum, deafness. Past history: Measles at 3 years with aural discharge. T. and A. operation one year ago. Oct. 8, second T. and A. operation. Deafness worse than before. No discharge, but ear feels sore to touch. Otalgia 3 days ago. Head cold. Pus in left naris. X-ray shows left antrum. Wassermann negative. A. D.: Drum dull and retracted with thickening and healed perforation, anteriorly and below. Ear dry. A. S.: Same as A. D. except for more retraction. Hearing test—

R		W.V.	L
2/25			2/25
20	R	ac	30
—		—	—
28	256C ¹	bc	24
	Weber	> +	
64	L.L.		32

Dec. 2, 1920. Left radical antrum operation.

May 27, 1921. Light reflex in right ear slightly broken. Drum retracted. Old scar anteriorly. Left ear, drum retracted. Fairly good light reflex. Slight thickening.

May 20, 1921—

R		W.V.	L
3/25			20/25
17	R	ac	30
—		—	—
28	256C ¹	bc	24
	Weber	> +	
N	U.L.		N
64	L.L.		32

Note.—No inflation. Infection cleared up and best ear improved from two to twenty feet for whispered voice.

Case 5.—R. Eff, O. M. S. L. O. M. S. Ch. Cum. Grans. J. C., 25 years, barber, married. May 25, 1921. Past history: History of discharge from left ear as a child, then for short and infrequent periods until two years ago. While at Camp Devens in 1919 had double pneumonia and the discharge has been at shorter intervals. No pain, no vertigo or headaches. Colds frequent. Chronic catarrh. History of diseases of childhood uncertain. Examination: B. cryptic tonsillar disease. Large central adenoid. Transillumination not so clear on the left side. M. M. of nares injected. Large gland under angle of left jaw.

Aural examination: Right ear. Healed horseshoe perforation involving greater part of membrana propria. Short process visible. Long process foreshortened and apparently tied down to the promontory. Large calcarious deposits in the scar tissue anterior to the long process over the region of the tube and in the posterior superior quadrant. Malleus does not move under otoscope. L. ear. Posterior superior half of drum grayish in color and thickened. Short process indistinct. Anterior and inferior half of drum filled with pale granulation tissue. Discharge moderate. Almost entire anterior half of drum replaced by granulation tissue. Hearing test:

R		L
25/25		25/25
16	R	16
8	256C ¹	9
N	Weber	N
32	U.L.	32
	L.L.	

Note.—Here was a history dating back to childhood of intermittent discharge, in which the conduction apparatus was seriously involved and yet there is normal hearing.

CONCLUSIONS.

1. Every case of loss of tone perception seems to result from the action of the toxin of a chronic pyogenic focus on the end organ.
2. The toxin is probably due to a special strain of bacteria with a selective action on the organ of hearing.
3. The gross tissue changes seem analogous to those taking place in other organs, as the result of a focal infection, the return of function in each case depending on the integrity of its special nerve mechanism—either the acoustic centers or cochlear nerve.
4. Diminished tone perception seems to start with the onset of the deafness and is more important than the changes in the conduction apparatus. The early raising of the low limits due to the blocked tube clears up as the tube opens. Following this the tube is more open on the side of the deaf ear as atrophy succeeds the hypertrophic salpingitis.
5. When the 256C¹ or 512C² fork shows lowered bone conduction nerve deafness is already far advanced.
6. The end result in chronic progressive deafness is marked perception impairment or nerve degeneration.
7. No hearing test is characteristic of any particular form of middle ear disease.
8. Gross tissue changes in the middle ear follow the original type of infection and do not change.
9. Alcohol and tobacco seem to cause eighth nerve deafness by causing a pharyngeal congestion with increased absorption of the toxin from the chronic focus.
10. Patients treated early have every right to expect recovery if the primary focus is removed and the deafness is confined to a functional disturbance of the acoustic centers.

LXI.

THE PROGNOSIS OF THE TUBERCULOUS
LARYNX.*

BY JOHN B. GREGG, A. B., M. S., M. D.,

SIoux FALLS, S. D.

The subject of tuberculosis of the larynx is of vital importance to the laryngologist, due to its common occurrence, to the great desire to alleviate the conditions imposed by the disease, and to its influence on the prognosis of pulmonary tuberculosis, which is always rendered more grave by the presence of a laryngeal involvement. The relative frequency of the laryngeal complication of pulmonary tuberculosis necessitates very careful study and well directed effort, in order that the system may be relieved of this additional lesion and thereby enabled to better carry on its battles with the main source of infection in the lungs or elsewhere.

In all cases of pulmonary tuberculosis early and frequently repeated laryngeal examinations should be made by a skilled laryngologist. This results in the discovery of many cases of incipient laryngeal involvement at a time when proper treatment will be most beneficial to the larynx. Not infrequently we have patients come to us because of the laryngeal condition who have had no symptoms indicating a pulmonary lesion. In but a few cases the diagnosis of tuberculosis of the larynx is made before any demonstrable lesion elsewhere can be found. One such patient had a definite tuberculous larynx, demonstrated by microscopic examination of a section, two years before the internist could find involvement elsewhere.

Although laryngeal tuberculosis is most frequently co-existent with or complicates pulmonary tuberculosis, yet Orth, Demme, Frankel, Progebinisky, Manasse and Steiner have each reported one case of primary tuberculosis where post-mortem findings have substantiated the clinical diagnosis. Per-

*Candidate's thesis for the American Laryngological, Rhinological and Otological Society.

sonally I have never seen a case of verified primary tuberculosis of the larynx.

The purpose of this article will be to give the results of the observations of the writer in his work at the Iowa State Sanatorium for the Treatment of Tuberculosis. The endeavor will be made to show how many different factors enter into the prognosis of the tuberculous larynx. At the outset I wish to state that all these cases were in Doctor Dean's service, with whom the writer was so fortunate as to be associated.

The report consists of 122 cases of laryngeal tuberculosis found in 610 cases of pulmonary tuberculosis at the sanatorium during the year 1919-1920. Criticism may be offered that the length of observation has been too short, but the writer's problem has been more to determine what factors enter into the consideration of the laryngeal prognosis. These cases were examined by the writer at regular weekly intervals, and an accurate record made of the condition found at each examination. At every examination the internist in charge of the case was present, in order to correlate the findings of the internist and laryngologist to the best interests of the patient. We have always felt that the decision as to whether any operation shall or shall not be done should be left to the internist, who is thoroughly conversant with every phase of the patient's condition, and that there should be the closest cooperation at all times. The larynx of every case which enters the sanatorium is examined, and even if found negative is reexamined at frequent intervals, for often a patient with a negative larynx on entrance will develop tuberculous laryngitis within six weeks.

Frequency of Laryngeal Tuberculosis.—Laryngeal involvement exists in a varying percentage of the cases of pulmonary tuberculosis, the exact percentage being in a measure determined by the accuracy and persistency of examinations. Osler¹ gives 18 to 30 per cent, while Willigk estimates the percentage at 13. Schroeder² estimates that 20 per cent of all cases of chronic pulmonary tuberculosis have laryngeal complications. Sir St. Clair Thomson in a report³ based on the study of 693 sanatorium cases found 25.6 per cent with laryngeal complication, while Fetterolf¹⁰ in a clinical postmortem

study of 100 cases dying of pulmonary tuberculosis found the larynx grossly involved in 83 per cent.

From the statistics of the Iowa Sanatorium we find that in 1737 cases of pulmonary tuberculosis there were 474 cases of laryngeal involvement, or in 27 per cent of the total number of cases. The 1737 pulmonary cases may be divided into 322 incipient cases, 722 moderately advanced cases and 693 far advanced cases. In the 322 incipient cases laryngeal tuberculosis was found in 31, or in 10 per cent. In the 722 moderately advanced cases laryngeal tuberculosis was found in 151, or in 21 per cent of the cases. In 693 far advanced pulmonary cases laryngeal involvement was found in 292, or in 42 per cent of cases.

Among 379 deaths at the sanatorium in the last five years, laryngeal tuberculosis was present in 165, or in 43 per cent of cases. The series of cases especially studied consists of 122 cases of laryngeal tuberculosis, or 20 per cent found in 610 pulmonary cases.

Sex.—Among the 122 cases of laryngeal tuberculosis females were affected in 57 per cent and males in 43 per cent of the cases. These figures show a discrepancy inasmuch as women preponderate at the institution. Taking the larger number of cases of laryngeal tuberculosis, the sex ratio is about equal.

Age.—Among the 122 cases studied 9 per cent, or 11 cases, were between the ages of 10 and 20. Thirty-eight per cent, or 46 cases, were between 21 and 30; 33 per cent, or 46 cases between 31 and 40; 15 per cent, or 18 cases between 41 and 50, and 5 per cent, or 6 cases, were between the ages of 51 and 60 years.

The above figures show the greatest number of cases (71 per cent) between the ages of 20 and 40; next come the cases between 40 and 50 years (15 per cent), then the cases occurring in youth (9 per cent), and lastly (5 per cent) the cases occurring between the age of 50 and 60 years. Wide extremes in the age may occasionally be encountered, varying from 12 months to 76 years. The percentage for young adults and children in this report may be small, due to the fact that there is but limited accommodation for children at this institution.

Among the eleven cases between the ages of 10 to 20 years,

the larynx remained unimproved in 6 (55 per cent) and improved in 5 (45 per cent).

In the 46 cases between 21 and 30 years of age, the larynx remained unimproved in 25 (54 per cent), improved in 11 (24 per cent), and arrested in 10 (22 per cent).

Of the 41 cases between 31 and 40 years of age the larynx remained unimproved in 21 (31 per cent), improved in 12 (29 per cent) and arrested in 8 (20 per cent).

Considering the 18 cases between the ages of 41 and 50 years of age, the larynx was unimproved in 13 (72 per cent), improved in 1 (6 per cent) and arrested in 4 (22 per cent).

Among the six cases between 51 and 60 years of age the larynx remained unimproved in three (50 per cent), improved in one (17 per cent), and arrested in two (33 per cent).

Of interest from the above data is the information that the percentage of unimproved larynges is higher between the ages of 41 and 50 years (72 per cent) than it is for all other ages (50 to 55 per cent).

Tubercle Bacilli.—Tubercle bacilli were found in the sputum in 87 per cent of the 122 cases.

Pulmonary hemorrhage occurred in 44 cases or in 36 per cent of all laryngeal cases. It has not been uncommon for the patient to date his laryngeal trouble from the time of the hemorrhage.

Definitions.—Before taking up the subject further it will be necessary to define terms to be employed.

Incipient: The incipient case is one in which there are slight or no constitutional symptoms (including especially gastric or intestinal disturbance or rapid loss of weight), slight or no elevation of temperature or acceleration of pulse; slight infiltration limited to the apex of one or both lungs or a small part of one lobe; no tuberculous complications.

Moderately advanced cases (M. A.), shows no marked impairment of function, either local or constitutional; marked infiltration more extensive than under incipient, with little or no evidence of cavity formation, no serious tuberculous complications.

The far advanced cases (F. A.) show marked impairment of function, local and constitutional; extensive localized infiltration or consolidation in one or more lobes, or disseminated

areas of cavity formation, or serious tuberculous complications.

Pulmonary classification on discharge:

Arrested (a.), all constitutional symptoms and expectoration with bacilli absent for a period of six months, the physical signs those of a healed lesion.

Apparently arrested (aa.), all constitutional symptoms and expectoration with bacilli absent for a period of three months, the physical signs to be those of a healed lesion.

Quiescent (Quies.) Absence of all constitutional symptoms; expectoration and bacilli may or may not be present; physical signs stationary or retrogressive; the foregoing conditions existing for at least three months.

Improved (Imp.): Constitutional symptoms lessened or entirely absent; physical signs improved or unchanged; cough and expectoration with bacilli usually present.

Unimproved (Unimp.): All essential symptoms and signs unabated or increased.

Laryngeal condition on discharge:

Arrested (a.): Laryngeal condition healed for six months or more.

Improved (Imp.): Laryngeal condition lessened markedly or a healed larynx of less than six months' duration.

Unimproved (Unimp.): Laryngeal condition unabated or increased in severity.

Pulmonary Condition on Admission.—In 122 cases of laryngeal tuberculosis the pulmonary involvement was incipient in 3, moderately advanced in 31, and far advanced in 88 cases.

A tabulated report of the pulmonary and laryngeal results is here given.

Incipient Cases:	Cases	Per Cent
Lungs improved with larynx improved.....	1	33.3
Lungs improved with larynx arrested.....	1	33.3
Lungs arrested with larynx arrested.....	1	33.3
Moderately advanced cases:		
Death with larynx unimproved.....	3	10
Lungs unimproved with larynx unimproved.....	3	10
Lungs unimproved with larynx improved.....	7	22
Lungs improved with larynx unimproved.....	4	13
Lungs improved with larynx improved.....	6	20
Lungs quiescent with larynx unimproved.....	0	0

	Cases	Per Copy
Lungs quiescent with larynx improved.....	2	6
Lungs quiescent with larynx arrested.....	5	16
Total.....	31	

Thus in the moderately advanced cases the larynx process was arrested in 16 per cent, improved in 48 per cent and unimproved in 33 per cent of cases. It is of interest to note that the larynx improved while the lungs remained unimproved in seven (22 per cent) of the cases, also that the larynx remained unimproved while the lungs improved in four (13 per cent) of cases.

In the moderately advanced cases the pulmonary condition became quiescent in 7 (22 per cent), improved in 10 (32 per cent), unimproved in 10 (32 per cent), and death occurred in 3 (10 per cent).

Far advanced cases:	Cases	Per Cent
Death with larynx unimproved.....	31	35
Death with larynx improved.....	1	1
Lungs unimproved with larynx unimproved.....	24	27
Lungs unimproved with larynx improved.....	5	6
Lungs improved with larynx unimproved.....	2	2
Lungs improved with larynx improved.....	8	9
Lungs improved with larynx arrested.....	5	6
Lungs quiescent with larynx improved.....	2	2
Lungs quiescent with larynx arrested.....	6	7
Lungs apparently arrested with larynx arrested.....	2	2
Lungs arrested with larynx arrested.....	2	2
Total.....	88	

In the far advanced cases the larynx process was arrested in 18 per cent, improved in 17 per cent and unimproved in 64 per cent of cases. The larynx improved while the lungs remained unimproved in five cases (6 per cent) and the larynx remained unimproved while the lungs improved in two cases (2 per cent).

The pulmonary condition in the far advanced cases was arrested in 2 (2 per cent), apparently arrested in 2 (2 per cent), became quiescent in 8 (9 per cent), improved in 15

(17 per cent), unimproved in 29 (33 per cent), and death occurred in 32 cases (36 per cent).

Our number of incipient cases is too small to be of any value, but we learn from comparison of the laryngeal results in the moderately advanced and far advanced cases that our prospects of improving the larynx are twice as good in the moderately advanced cases (64 per cent) as in the far advanced cases (35 per cent). In other words, the laryngeal prognosis varies directly with the extent of pulmonary involvement.

Consulting the records of 1737 cases of pulmonary tuberculosis whose histories can be traced at the sanatorium, we find laryngeal involvement in 474 cases, or in 27 per cent of the total number. In 322 incipient cases laryngeal tuberculosis was found in 31, or in 10 per cent of cases. Considering these 31 incipient pulmonary cases with laryngeal involvement, 8, or 25 per cent, died; 2, or 6 per cent, were discharged unimproved, 2 or 6 per cent as improved, 12 or 38 per cent as quiescent, 7 or 22 per cent as apparently arrested, and 1 or 3 per cent as arrested; this rating being from the pulmonary and general condition.

In the 291 cases of incipient pulmonary tuberculosis without laryngeal involvement, 23 or 8 per cent died, 29 or 10 per cent were discharged with lungs unimproved, 71 or 24 per cent as improved, 63 or 22 per cent as quiescent, 85 or 29 per cent as apparently arrested, and 20 or 7 per cent as arrested.

In 722 moderately advanced cases laryngeal tuberculosis occurred in 151 or 21 per cent of cases. Of these 151 cases of moderately advanced tuberculosis with laryngeal involvement 25 or 17 per cent died, 55 or 36 per cent were discharged with lungs unimproved, 28 or 18 per cent as improved, 27 or 18 per cent as quiescent, 13 or 9 per cent as apparently arrested and 3 or 2 per cent as arrested.

In the 571 cases of moderately advanced pulmonary tuberculosis without laryngeal involvement, 57 or 10 per cent died, 116 or 20 per cent were discharged with lungs unimproved, 143 or 25 per cent as improved, 146 or 25 per cent as quiescent, 89 or 16 per cent as apparently arrested and 20 or 4 per cent as arrested.

In 693 far advanced pulmonary cases, laryngeal tuberculosis was found in 292 or in 42 per cent of cases. Of these 292 cases, 132 or 45 per cent died, 82 or 28 per cent were discharged with lungs improved, 62 or 21 per cent as improved, 13 or 5 per cent as quiescent, 1 or 3 per cent as apparently arrested, and 2 or 6 per cent as arrested. Of the 401 cases of far advanced pulmonary tuberculosis without laryngeal involvement 132 or 33 per cent died, 111 or 28 per cent were discharged with lungs unimproved, 54 or 13 per cent as improved, 77 or 19 per cent as quiescent, 24 or 6 per cent as apparently arrested and 3 or 1 per cent as arrested.

Of paramount interest in the above tabulations is the fact that the percentage of deaths in incipient tuberculosis with laryngeal involvement is three times as great (25 per cent) as is found in the pulmonary involvement alone (8 per cent). In moderately advanced tuberculosis with laryngeal involvement the mortality was 17 per cent, while in cases without the laryngeal complication the mortality was but 10 per cent.

In far advanced pulmonary tuberculosis with the laryngeal complication the mortality was 45 per cent, while in the same class of cases without the complication the mortality was 33 per cent.

General Condition.—By the general condition, we mean the evident ability or lack of ability of the individual to fight against the infection; with or without the tendency toward tissue repair as shown by the previous history. The patient's general condition is classified as favorable, guardedly favorable or unfavorable by the internist at the time of his admission to the sanatorium.

In our series of cases the general condition was favorable in 8, guardedly favorable in 15, and unfavorable in 99 cases. The laryngeal condition was arrested in 75 per cent of the favorable cases, and improved in the remaining 25 per cent. The laryngeal condition was arrested in 27 per cent, improved in 27 per cent and unimproved in 47 per cent of the guardedly favorable cases.

Among the 99 unfavorable cases, the laryngeal condition was arrested in 13 per cent, improved in 25 per cent and unimproved in 62 per cent of the cases.

Thus we realize that our laryngeal prognosis varies directly with a favorable or unfavorable general condition.

Digestion.—Whether of not digestion is impaired is to be considered, inasmuch as impaired digestion makes its results manifest on the system as a whole, with the laryngeal improvement or lack of improvement directly affected.

In our series of cases digestion was impaired in 34 and unimpaired in 88 cases. Of those in which digestion was impaired, the larynx process was arrested in 3 per cent, improved in 24 per cent and unimproved in 73 per cent of cases. Among those where digestion was unimpaired the larynx was arrested in 25 per cent, improved in 28 per cent and unimproved in 47 per cent of cases.

To show the pulmonary results: among those with impaired digestion 3 per cent were discharged as arrested, 3 per cent as quiescent, 15 per cent as improved, 26 per cent as unimproved, and 53 per cent died.

Among those with unimpaired digestion 4 per cent were discharged as arrested, 16 per cent as quiescent, 28 per cent as improved, 34 per cent as unimproved and 18 per cent died.

The presence of a tuberculosis enteritis or colitis is of marked importance when occurring in a case of pulmonary tuberculosis with laryngeal involvement. In this series of 122 cases there were 19 such cases, of which 14 died and 4 remained unimproved as regards general condition. The larynx was arrested in 1 case, improved in 2 cases and remained unimproved in 16 cases, or 84 per cent.

In a study of the general prognostic significance of laryngeal and intestinal tuberculosis occurring together with a pulmonary affair, our records for the last few years have been used. In a series of 239 cases of pulmonary and laryngeal tuberculosis without intestinal involvement there has been death in 72 or in 30 per cent of cases. In a series of 95 cases of pulmonary and intestinal tuberculosis without laryngeal involvement there was death in 36 or 38 per cent of cases. In a series of 49 cases of combined pulmonary laryngeal and intestinal tuberculosis death occurred in 30 or in 61 per cent of cases.

In brief, the more extensive the infection, the higher the

mortality and the poorer the prospect for improvement in the laryngeal condition.

Pregnancy.—Pregnancy has long been considered a dangerous complication of tuberculosis. Godskesen of Copenhagen has laid special emphasis on this condition as a complication of laryngeal tuberculosis. He reports 55 cases, 24 from literature, 31 from his own experience. Of his 31 cases, 26 developed the condition of the larynx during pregnancy. The larynx in only five of the cases was materially improved by active treatment.

In this series of cases pregnancy was present in two cases. The larynx rapidly became worse and death resulted in each case. In our six other cases of pregnancy complicating laryngeal tuberculosis, two died and four are alive. Thus in the total of eight cases, death resulted in 50 per cent of cases. The larynx was improved in only two cases after delivery.

Symptoms.—Laryngologists seem to be well agreed that there are no distinctly pathognomonic symptoms of tuberculosis of the larynx. The more extensive his experience, the fewer positive signs does he consider. The early symptoms are usually those of simple chronic laryngitis, tickling in the throat, feeling of dryness (rare in our experience) and slight huskiness. As the process extends, there is a cough of a "husky, ineffectual type." This huskiness develops into hoarseness and may go on to complete aphonia. It is well to remember that the hoarseness may be due to a paresis of the recurrent laryngeal nerve, caused by pressure of tuberculous glands, the larynx itself being uninvolved. With the development of tuberculomata in the larynx, dyspnea may supervene, although this is rare. The writer has been compelled to do a tracheotomy in but one case where there was extensive involvement with edema of the whole larynx.

Reverting to the question of hoarseness in laryngeal tuberculosis: the writer while assigned to the British Royal Army Medical Corps, picked up at least a score of cases of laryngeal tuberculosis, the laryngeal disease evidently having developed subsequent to the severe laryngitis produced by mustard gas.

In our series of cases, hoarseness at some time or other was the most common symptom, being present in 99, or 81

per cent of cases. This condition varied, of course, from a slight huskiness to complete aphonia, and in duration from a month to several years. The hoarseness in 30 per cent of cases began soon after the onset of marked coughing. Dysphagia was present in 23 cases, of which number 17 had marked involvement of the epiglottis. Ten cases with involvement of the epiglottis gave no history of dysphagia. As a factor in the production of dysphagia, marked infiltration with ulceration of the arytenoids and aryepiglottidean folds has been found by us to be of importance.

In twenty (16 per cent) cases of laryngeal tuberculosis there were no laryngeal symptoms whatsoever.

Laryngeal Involvement.—Examination of the larynx shows early a condition resembling chronic simple laryngitis—that is, a hyperemia of the mucosa of the cords and interarytenoid space. Slight infiltration may be added to the above picture early. The site of the early infiltration is usually the interarytenoid space, seen as a circumscribed swelling forming a convex projection during deep inspiration. It is usually located in the midline, but may be found on one or both sides, in the latter case giving the central portion a sunken or punched out appearance. The swelling may be a broad based, flat affair or a definite tumorlike mass, in nearly all cases presenting on its surface a grayish roughened appearance due to the breaking down of the surface epithelium. In rare cases it may take on a papillomatous aspect.

In the vocal cords, the infiltrate may take on the form of a diffuse or circumscribed redness with moderate swelling strongly suggestive of a simple chronic laryngitis. The tuberculous process usually involves one side, or one side to a greater extent than the other. There may be circumscribed infiltration, most common on the vocal processes and generally found in connection with hyperplasia of the interarytenoidal mucosa. In such cases the posterior ends of the cords are of a deep pink or red color, somewhat uneven or notched along the free edge and rounded in form with an apparent increase in both width and thickness.¹⁰ There may be simply alteration in color, either as a redness or loss of pearly luster, and even this slight change limited to one cord is highly suggestive. There may be slight infiltration of the anterior commis-

sure affecting either the angle of the cords or the region above or below it and resulting markedly in interference with adduction and phonation. As the infiltration persists, reaching the central portion of the cords, they assume their characteristic cylindrical form. This swelling may assume large proportions, the cords becoming several times their normal size, and as in other portions of the larynx, the surface epithelium of the cord may be quickly eroded, leaving shallow ragged ulcers.

The arytenoid cartilages may also be affected, unilaterally most frequently, and bilaterally in many cases as the disease progresses. The process here consists of infiltration showing as a swelling of deep red or purplish color, the extremities of which extend upward and outward until lost in the aryepiglottic folds. If the infiltration is of long standing, the mucosa becomes pale and translucent, movement of the cords is mechanically hindered by the enlarged cartilage as well as by ankylosis of the cricoarytenoid joint. There is usually more or less edema present about the cartilage and along the usually infiltrated aryepiglottidean folds, which tend in some cases, where the swelling is marked, to close off the entrance to the larynx resulting in a marked dyspnea and dysphagia.

The epiglottis is usually affected later, and in the milder cases presents an appearance of being thickened, with the edges slightly rolled on themselves, bright red or pale in color. In more advanced cases it may be greatly swollen, assuming the characteristic turban shape, with either slight or extensive ulceration and destruction. Severe pain is usually associated with involvement of the epiglottis, and slight infiltration destroys its mobility. In some cases the epiglottis may be almost entirely eroded.

under the angle of the glottis.
most common in the ventricles, in the interarytenoid space and
They may be found in all portions of the larynx, being the
The tubercle is of comparatively frequent appearance.
Any and all of the above lesions may go on to ulceration
which may be superficial or deep and destructive. The most
frequent sites of ulceration include the vocal cords, interary-
tenoid sulcus, arytenoid cartilages and epiglottis. Ulceration
may occur, however, on all segments of the larynx.

In our series of 122 cases, the epiglottis was involved in 27, or in 22 per cent of cases. There was infiltration alone in 8 cases and infiltration with ulceration in 19 cases. Of the 27 cases showing involvement of the epiglottis death occurred in 12 cases (44 per cent) within one year, 6 cases (22 per cent) were discharged as unimproved, 7 (26 per cent) as improved, 1 (4 per cent) as quiescent, and 1 (4 per cent) apparently arrested from the pulmonary standpoint. The laryngeal condition remained unimproved in 20 cases (74 per cent), was improved in 4 cases (15 per cent) and became arrested in 3 cases (11 per cent).

The writer remembers distinctly two cases in which the laryngeal involvement was limited entirely to the epiglottis. The epiglottis was amputated, proven tuberculous on section, and the larynx and pulmonary condition, which had remained stationary previous to the amputation, went on to recovery.

The arytenoids were involved in 36 or in 29 per cent of the laryngeal cases. They showed infiltration in 27 and infiltration with ulceration in 9 cases.

The interarytenoid space was infiltrated in 57, and infiltrated with ulceration in 16, giving the total involvement as 73 cases, or 59 per cent.

The vocal cords were infiltrated in 25 and ulcerated in 35, giving a total involvement of 60, or 49 per cent of the total number of cases.

The false cords were infiltrated in eleven and showed infiltration with ulceration in 5 cases. With a total of 16 cases this would give an involvement of 13 per cent.

The whole larynx was involved in 13 cases or in 12 per cent of the total number. Of these 13 cases, 9 or 69 per cent died within one year, two (15 per cent) were discharged unimproved, and 2 (15 per cent) as improved. The larynx remained unimproved in 11 cases (85 per cent) and improved in 2 cases (15 per cent).

It is very evident, therefore, that involvement of the epiglottis or extensive involvement throughout the larynx, indicates a poor prognosis both as regards life and as regards probability of improving the laryngeal condition.

Treatment.—In the treatment of laryngeal tuberculosis there are certain general features on which all are agreed. The

first of these is the influence of careful supervision of the daily life of the patient, his rest, diet, hygiene, exercise, and so on. One should insist that the patient be under sanatorium or hospital treatment, for those who will not place themselves under such care are hampering their progress, and in many instances turning the balance from recovery to a fatal termination. All of our cases were patients at the State Sanatorium, with which we have the closest cooperation, and it has been largely due to this cooperation that good results have been obtained. Much depends on the patient's determination to do his part, and this unquestionably is made easier by the carefully regulated sanatorium life.

Absolute rest of voice is insisted upon for all, regardless of what their other treatment may be. Some cases of laryngeal tuberculosis are cured wholly by silence.

Steam inhalations, using compound tincture of benzoin twice daily, are given at the sanatorium.

Lactic acid in 50 per cent solution is applied daily to the larynx, the exact lesion being brushed carefully with it. Formalin is used in some cases, beginning with a very weak solution and gradually increasing the strength as rapidly and as far as the patient seems to do well on it. We have applied it in 2 per cent solution with no discomfort to the patient. Some larynges will do best under one form of treatment; others will demand different treatment. It is only by keeping close watch of the larynx that one gains the best results.

For relief of dysphagia we use orthoform, anesthesia, injection of the superior laryngeal nerves, and where the epiglottis is involved, amputation of this structure. It is well to state here that aside from the relief of pain, the laryngeal lesion is in some cases favorably affected by removal of the epiglottis. This is due more indirectly than directly, deglutition is made easier and the increased alimentation results in improvement in the general condition.

In cases whose general condition is very poor, or where there is a continued pronounced breaking down in the lungs, the above treatment only is used. This is also true of those cases in which practically the entire larynx is involved.

Given cases who have a fair chance of recovery from the general standpoint, this method is combined with surgical

treatment. The object in this, as in any form of treatment of laryngeal tuberculosis, may be summed up in the one word, fibrosis.

As a rule, when the diagnosis of laryngeal tuberculosis is made, local applications are first tried; lactic acid, 50 per cent, applied to the larynx daily. If there develops a small infiltration of the vocal angle or interarytenoid space, the cautery is tried, repeating every fortnight. The local applications are continued as before. If the infiltration does not yield to this treatment, the infiltrated area is curetted. If the infiltration now subsides, the cautery is resumed; if not, the curette is again used in two weeks.

If there is a tuberculoma in the interarytenoid space or a well circumscribed tuberculoma of the false cords, or a small tuberculoma or ulcer on the true cord, this is removed by the laryngeal forceps. If there is an interarytenoid tuberculoma in addition to the excision the base is curetted. Following this the cautery is used, or the curette, the choice being dependent upon the return of infiltration or tumor. Tuberculomas may require several excisions, but as a rule two or three excisions bring them down to the point where they can be controlled by other methods.

If the local application of lactic acid does not seem to be causing the lesion to fibrose, a change is made to formalin, usually 1 per cent. It must be emphasized that the success of treatment is based upon constant observation and a prompt change of treatment when change is indicated.

The results obtained in the treatment of laryngeal tuberculosis have, on the whole, been gratifying. The fact that many cases of tuberculosis have a better result in the larynx than they do in the pulmonary lesion shows very markedly the efficacy of the treatment. When one recalls that less than 25 years ago the presence of a laryngeal tuberculosis was considered a death warrant, one may be pardoned for showing considerable optimism.

All of our cases received the regular routine treatment: sanatorium care, rest of voice, steam inhalations and the local application of lactic acid or formalin as indicated. Forty-one cases received this routine treatment only, while 81 cases received combined routine and surgical treatment. Amputation

of the epiglottis was done in 17 cases with good results. Injection of the superior laryngeal nerve was done in 13 cases. It was usually found necessary to reinject about once a week, although some cases were relieved of pain by a single injection. Curettment alone was used in six, cautery alone in twenty, and combined curettment and cautery in thirty-five cases. In these cases 111 curettments were done and 213 cauteries. All the amputations of the epiglottis and curettments were done by the suspension method; also a majority of the cauteries. Using this method we feel that the treatment is more accurate and thorough.

Results.—Considering the total number, or 122 cases, the laryngeal condition remained unimproved in 68, or in 56 per cent; it was improved in 30, or in 25 per cent, and arrested in 24, or 19 per cent. Combining the improved and arrested cases, we have a total improvement, considering all cases, of 44 per cent.

Among the 41 cases not treated surgically the larynx in 37, or 90 per cent, remained unimproved, while 4, or 10 per cent, were improved. These cases were considered by the internist as unfit for surgical treatment, due to marked, progressive involvement of lungs. Of the 81 cases treated surgically, 31 or 38 per cent remained unimproved, 26 or 32 per cent improved, and 24 or 20 per cent were arrested. Combining the improved and arrested cases, we have a total laryngeal improvement of 62 per cent in those cases treated by the combined routine and surgical method.

If the pulmonary and general condition of the patient on discharge is considered and compared with the laryngeal condition on discharge, it is found that in 35 cases who died the laryngeal condition was unimproved in 34 or 97 per cent and was arrested in 1 case or 3 per cent.

The laryngeal condition in 42 cases who were discharged with lungs unimproved, was unimproved in 28 or 67 per cent, improved in 13 or 31 per cent, and became arrested in 1 case or 2 per cent.

In 25 cases discharged with the lungs improved the laryngeal condition was unimproved in 6 or 24 per cent, improved in 13 or 52 per cent, and became arrested in 6 or 24 per cent. Combining improved and arrested larynges we find a total im-

provement of 76 per cent in cases where the pulmonary and general condition was definitely improved.

Among 15 cases discharged with lungs quiescent, the laryngeal condition was unimproved in 1 case or 7 per cent. The laryngeal condition was improved in 3 or 20 per cent and arrested in 11 or 53 per cent, giving a total improvement of 73 per cent.

Five cases were discharged as apparently arrested from the pulmonary and general standpoint, and in each case or 100 per cent the larynx was arrested.

The development of tuberculosis of the larynx without any question renders the final outcome of the disease process less hopeful. This is true, not only because of the added lesion which the body must resist, but it is an added evidence, in early cases, of either a lack of resistance or of a very virulent type of infection. In the average case it is an evidence that the disease is progressing, that the bodily defenses are being broken down; in other words, the disease has reached an advanced stage.

Not so many years ago the development of laryngeal tuberculosis was considered as a notice to the physician and the patient that further attempts at resistance were useless. With the advances made in the past 20 years in the treatment of this complication this gloomy outlook no longer obtains, although it must not be forgotten that it is serious.

Considering the laryngeal lesion, the most that physicians could hope to do 20 years ago was to relieve pain and hope for euthanasia. Contrasted with this, we now find a very different attitude among laryngologists and tuberculosis specialists. All admit that the situation demands careful, conservative judgment and united action on the part of physician and patient; but the records show that a gradually growing and gratifying percentage of cases do recover, and well authenticated cases of permanent cures are many.

A definite laryngeal prognosis is, however, very difficult. An early diagnosis, of course, is essential to a favorable prognosis. Other factors must be weighed: age, stage of the pulmonary condition, general condition, digestion, other complications, extent of laryngeal involvement, progress of pulmonary condition, cooperation of the patient, general supervisory

control, and the skill and experience of the laryngologist. The laryngeal prognosis depends on the sum total of the above factors.

CONCLUSIONS.

1. Laryngeal tuberculosis is found in 10 per cent of incipient cases, in 21 per cent of moderately advanced cases, and in 42 per cent of far advanced cases of pulmonary tuberculosis.

2. The percentage of unimproved larynges is higher between the ages of 40 to 50 (72 per cent) than it is for all other decades (50 to 55 per cent).

3. The percentage of improved larynges was twice as high in the moderately advanced (64 per cent) as it was in the far advanced cases of pulmonary tuberculosis, 35 per cent. In other words, the laryngeal prognosis varies directly with the extent of the pulmonary involvement.

4. The mortality within one year in incipient pulmonary tuberculosis with laryngeal involvement is three times as great (25 per cent) as is found in the same type of pulmonary cases without the laryngeal complication.

The mortality within one year, in moderately advanced pulmonary tuberculosis with laryngeal involvement, is twice as great (17 per cent) as is found in the same type of cases without the laryngeal complication (10 per cent).

In far advanced pulmonary tuberculosis with the laryngeal complication, the mortality was 45 per cent or but 12 per cent higher than in the same class of cases without the laryngeal involvement (33 per cent).

5. The laryngeal prognosis varies directly with a favorable or unfavorable general condition.

6. In cases with unimpaired digestion, the percentage of unimproved larynges was 47, while in those with impaired digestion 73 per cent of the larynges were unimproved.

7. Intestinal tuberculosis occurring in cases of pulmonary and laryngeal tuberculosis gave a mortality of 74 per cent within one year and unimprovement in the larynx in 84 per cent of cases.

8. Involvement of the epiglottis, or extensive involvement throughout the larynx, indicates a poor prognosis both as regards life and as regards probability of improving the laryngeal condition.

9. The improvement or lack of improvement in the larynx, if treated carefully, parallels closely (with exceptions) the improvement or lack of improvement in the lungs and general condition.

CASE REPORTS.

Case 1.—Sex, female; pulmonary condition on admission, FAC.; involvement, TIII; side involved, R. III., L. III.; duration of lesion, pulmonary, 5 years; general condition, unfavorable; digestion, impaired; tubercle bacilli, +; hemorrhage, +; other complications, tuberpleuritis; laryngeal symptoms, hoarseness; laryngeal involvement, ulceration L. false cord and each true cord; much interarytenoid infiltration.

Case 2.—Sex, male; pulmonary condition on admission, Maa.; involvement, TII.; side involved, RI., LII.; duration of lesion, pulmonary, 8 years; general condition, guardedly favorable; digestion, impaired; tubercle bacilli, +; hemorrhage, —; laryngeal symptoms, none; laryngeal involvement, tuberculoma posterior end T. cord and interarytenoid; each cord ulcerated.

Case 3.—Sex, male; pulmonary condition on admission, FAC.; involvement, T. III.; side involved, R. III., L. III.; duration of lesion, pulmonary, 2 years; general condition, unfavorable; digestion, unimpaired; tubercle bacilli, +; hemorrhage, —; laryngeal symptoms, hoarseness, 15 mo.; laryngeal involvement, interarytenoid tuberculoma.

Case 4.—Sex, female; pulmonary condition on admission, FAC.; involvement, T. III.; side involved, R. III., L. III.; duration of lesion, pulmonary, 7 years; general condition, unfavorable; digestion, impaired; tubercle bacilli, +; hemorrhage, —; other complications, T. B. of left kidney, enteritis colitis; laryngeal symptoms, hoarseness and dysphagia; laryngeal involvement, infiltration and ulceration epiglottis, much arytenoid and interarytenoid infiltration.

Case 5.—Sex, male; pulmonary condition on admission, FAC.; involvement, T. III.; side involved, R. III., L. II.; duration of lesion, pulmonary, 5 years; general condition, unfavorable; digestion, unimproved; tubercle bacilli, +; hemorrhage, —; other complications, myocarditis; laryngeal symptoms, hoarseness; laryngeal involvement, arytenoid and interarytenoid space infiltrated.

Case 6.—Sex, female; pulmonary condition on admission, FAB.; involvement, T. III.; side involved, R. II., L. III.; duration of lesion, pulmonary, 3 years; general condition, unfavorable; digestion, unimpaired; tubercle bacilli, +; hemorrhage, +; other complications, pleurisy; laryngeal symptoms, hoarseness 4 years; laryngeal involvement, cords thickened, reddened.

Case 7.—Sex, male; pulmonary condition on admission, MAB.; involvement, T. II.; side involved, R. I., L. II.; duration of lesion, pulmonary, 4 years; general condition, unfavorable; digestion, unimpaired; tubercle bacilli, +; hemorrhage, —.

Case 8.—Sex, female; age, 23; pulmonary condition on admission, FAC.; involvement T. III.; side involved, R. III., L. III.; duration of lesion, pulmonary, 8 mo.; general condition, unfavorable; digestion, impaired; tubercle bacilli, +; hemorrhage, —; laryngeal symptoms, hoarseness, 1 mo.; laryngeal involvement, left cord infiltrated, arytenoids infiltrated, interarytenoid space ulcerated.

Case 9.—Sex, male; age, 23; pulmonary condition on admission, FAA.; involvement, T. III.; side involved, R. I., L. I.; duration of lesion, pulmonary, 13 mo.; general condition, unfavorable; digestion, unimpaired; tubercle bacilli, +; hemorrhage, —; other complications, fibroplastic endocarditis; laryngeal symptoms, hoarseness, 1 year; laryngeal involvement, epiglottis thickened, infiltration each arytenoid and interarytenoid space.

Case 10.—Sex, male; age, 31; pulmonary condition on admission, MAC.; involvement, T. II.; side involved, R. I., L. I.; duration of lesion, pulmonary, 2 years; general condition, unfavorable; digestion, unimproved; tubercle bacilli, +; hemorrhage, —; laryngeal symptoms, hoarseness, 1 year; laryngeal involvement, epiglottis enormous thickened and ulcerated, infiltrated throughout while larynx.

Case 11.—Sex, female; age, 10; pulmonary condition on admission, MAB.; involvement, T. II.; side involved, R. I., R. I.; duration of lesion, pulmonary, 8 mo.; general condition, guardedly unfavorable; digestion, unimpaired; tubercle bacilla, +; hemorrhage, —; laryngeal symptoms, hoarseness 2 years and dysphagia 4 mo.; laryngeal involvement, infiltra-

tion of interarytenoid space with slight thickening each true cord.

Case 12.—Sex, female; age, 20; pulmonary condition on admission, FAC.; involvement, T. III.; side involved, R. I., R. III.; duration of lesion, pulmonary, 2 years; general condition, unfavorable; digestion, unimpaired; tubercle bacilli, +; hemorrhage, +; laryngeal symptoms, cough and hoarseness, 5 mo.; laryngeal involvement, interarytenoid tuberculoma.

Case 1.—Laryngeal treatment, routine; larynx when discharged, unimproved; lung condition on discharge, unimproved.

Case 2.—Laryngeal treatment, curette and cautery; larynx when discharged, improved; lung condition on discharge, quiescent.

Case 3.—Laryngeal treatment, routine; larynx when discharged, unimproved; lung condition on discharge, unimproved.

Case 4.—Laryngeal treatment, routine; larynx when discharged, unimproved; lung condition on discharge, unimproved.

Case 5.—Laryngeal treatment, amputation epiglottis; larynx when discharged, unimproved; lung condition on discharge, died.

Case 6.—Laryngeal treatment, routine; larynx when discharged, unimproved; lung condition on discharge, died.

Case 7.—Laryngeal treatment, cautery; larynx when discharged, A.; lung condition on discharge, quiescent.

Case 8.—Laryngeal treatment, curette and cautery; larynx when discharged, improved; lung condition on discharge, improved.

Case 9.—Laryngeal treatment, routine; larynx when discharged, unimproved; lung condition on discharge, unimproved.

Case 10.—Laryngeal treatment, amputation epiglottis, curette and cautery; larynx when discharged, improved; lung condition on discharge, unimproved.

Case 11.—Laryngeal treatment, cautery; larynx when discharged, improved; lung condition on discharge, unimproved.

Case 12.—Laryngeal treatment, curette, cautery; larynx when discharged, improved; lung condition on discharge, improved.

Case 13.—Sex, female; age, 28; pulmonary condition on admission, FAB.; involvement, T. III.; side involved, R. II., L. III.; duration of pulmonary lesion, 2 years; general condi-

tion, unfavorable; digestion, impaired; tubercle bacilli, +; hemorrhage, +; laryngeal symptoms, hoarseness, 1 mo.; laryngeal involvement, interarytenoid tuberculoma; laryngeal treatment, routine; larynx when discharged, unimproved; lung condition on discharge, unimproved.

Case 14.—Sex, female; age, 36; pulmonary condition on admission, FAC.; involvement, T. III.; side involved, R. III., L. II.; duration of pulmonary lesion, 6 years; general condition, unfavorable; digestion, unimpaired; tubercle bacilli, +; hemorrhage, —; laryngeal symptoms, hoarseness, 4 mo.; laryngeal involvement, ulceration posterior end L. true cord, infiltration of interarytenoid space; laryngeal treatment, routine; larynx when discharged, unimpaired; lung condition on discharge, unimproved.

Case 15.—Sex, female; age, 33; pulmonary condition on admission, FAB.; involvement, T. III.; side involved, R. II., L. III.; duration of pulmonary lesion, 21 years; general condition, unfavorable; digestion, unimpaired; tubercle bacilli, +; hemorrhage, —; laryngeal symptoms, hoarseness, 6 mo.; laryngeal involvement, interarytenoid infiltration with superficial ulceration; laryngeal treatment, injection superior laryngeal; larynx when discharged, improved; lung condition on discharge, unimproved.

Case 16.—Sex, female; age, 20; pulmonary condition on admission, FAB.; involvement T. III.; side involved, R. III., L. III.; duration of pulmonary lesion, 2 years; general condition, unfavorable; digestion, unimpaired; tubercle bacilli, —; hemorrhage, —; laryngeal symptoms, hoarseness, dysphagia; laryngeal involvement, tuberculoma interarytenoid space, infiltration R. false cord; laryngeal treatment, curette, cautery; larynx when discharged, unimproved; lung condition on discharge, unimproved.

Case 17.—Sex, male; age, 26; pulmonary condition on admission, FAB.; involvement, T. III.; side involved, R. III., L. III.; duration of pulmonary lesion, 1 year; general condition, unfavorable; digestion, unimpaired; tubercle bacilli, +; hemorrhage, —; laryngeal symptoms, hoarseness, cough; laryngeal involvement, larynx waxy appearance throughout, cords infiltrated; larynx when discharged, improved; lung condition on discharge, improved.

Case 18.—Sex, male; age, 33; pulmonary condition on admission, FAB.; involvement, T. III.; side involved, R. III., L. III.; duration of pulmonary lesion, 1 year; general condition, unfavorable; digestion, impaired; tubercle bacilli, +; hemorrhage, —; other complications, T. B., pleuritis, T. B. tongue; laryngeal symptoms, hoarseness; laryngeal involvement, ulceration each vocal cord, interarytenoid ulceration; laryngeal treatment, routine; larynx when discharged, unimproved; lung condition on discharge, died.

Case 19.—Sex, female; age, 20; pulmonary condition on admission, FAB.; involvement, T. III.; side involved, R. III., L. III.; duration of pulmonary lesion, 2 years; general condition, unfavorable; digestion, impaired; tubercle bacilli, +; hemorrhage, +; other complications, T. B., pleuritis; laryngeal symptoms, hoarseness, dysphagia; laryngeal involvement, infiltration left cord and left arytenoid; laryngeal treatment, routine; larynx when discharged; unimproved; lung condition on discharge, died.

Case 20.—Sex, female; age, 26; pulmonary condition on admission, FAB.; involvement, T. III.; side involved, R. I., L. III.; duration of pulmonary lesion, 9 years; general condition, unfavorable; digestion, unimpaired; tubercle bacilli, +; hemorrhage, —; laryngeal symptoms, hoarseness, dryness; laryngeal involvement, infiltration arytenoid and interarytenoid space; laryngeal treatment, curette; larynx when discharged, unimproved; lung condition on discharge, unimproved.

Case 21.—Sex, female; age, 23; pulmonary condition on admission, FAC.; involvement, T. III.; side involved, R. H., L. III.; duration of pulmonary lesion, 4 years; general condition, unfavorable; digestion, unimproved; tubercle bacilli, +; hemorrhage, +; laryngeal symptoms, hoarseness; laryngeal involvement, interarytenoid infiltration and ulceration; laryngeal treatment, curette; larynx when discharged, unimproved; lung condition on discharge, died.

Case 22.—Sex, female; age, 21; pulmonary condition on admission, MAC.; involvement, T. II.; side involved, R. II.; L. II.; duration of pulmonary lesion, 5 years; general condition, unfavorable; digestion, unimpaired; tubercle bacilli, +; hemorrhage, —; laryngeal symptoms, hoarseness; laryngeal involvement, much ulceration each vocal cord; laryngeal treat-

ment, routine; larynx when discharged, unimproved; lung condition on discharge, improved.

Case 23.—Sex, male; age, 33; pulmonary condition on admission, FAB.; involvement, T. II.; duration of pulmonary lesion, 2 years; side involved, R. III., L. III.; general condition, favorable; digestion, unimpaired; tubercle bacilli, —; hemorrhage, —; laryngeal symptoms, hoarseness 1 year; laryngeal involvement, interarytenoid infiltration with ulceration, R. cord; laryngeal treatment, curette, cautery; larynx when discharged, A.; lung condition on discharge, AA.

Case 24.—Sex, female; age, 24; pulmonary condition on admission, MAB.; involvement, T. II.; duration of pulmonary lesion, 1 year; side involved, R. I., L. II.; general condition, favorable; digestion, unimpaired; tubercle bacilli, +; hemorrhage, —; laryngeal symptoms, none; laryngeal involvement, interarytenoid infiltration; laryngeal treatment, curette and cautery; larynx when discharged, A.; lung condition on discharge, quiescent.

Case 25.—Sex, female; age, 37; pulmonary condition on admission, MAC.; involvement, T. II.; duration of pulmonary lesion, 4 years; side involved, R. III., L. I.; general condition, unfavorable; digestion, impaired; tubercle bacilli, +; hemorrhage, +; laryngeal symptoms, hoarseness; laryngeal involvement, ulcerated cord; laryngeal treatment, cautery; larynx when discharged, improved; lung condition on discharge, unimproved.

Case 26.—Sex, female; age, 37; pulmonary condition on admission, FAC.; involvement, T. III.; duration of pulmonary lesion, 5 years; side involved, R. III., L. II.; general condition, unfavorable; digestion, impaired; tubercle bacilli, +; hemorrhage, —; laryngeal symptoms, hoarseness; laryngeal involvement, extensive involvement, perichondritis, epiglottis eroded, amputation epiglottis, injections; larynx when discharged, unimproved; lung condition on discharge, died.

Case 27.—Sex, male; age, 42; pulmonary condition on admission, MAB.; involvement, T. II.; duration of pulmonary lesion, 9 mo.; side involved, R. II., L. II.; general condition, G. favorable; digestion, unimpaired; tubercle bacilli, +; hemorrhage, —; laryngeal symptoms, hoarseness; laryngeal involvement, left cord infiltrated, both false cords infiltrated;

laryngeal treatment, routine; larynx when discharged, unimproved; lung condition on discharge, unimproved.

Case 28.—Sex, male; age, 23; pulmonary condition on admission, MAA.; involvement, T. III.; duration of pulmonary lesion, 16 mo.; side involved, R. III., L. I.; general condition, unfavorable; digestion, unimpaired; tubercle bacilli, +; hemorrhage, —; laryngeal involvement, R. cord ulcerated, interarytenoid infiltration; laryngeal treatment, routine; larynx when discharged, improved; lung condition on discharge, unimproved.

Case 29.—Sex, male; age, 49; pulmonary condition on admission, FAB.; involvement, T. III.; side involved, R. III., L. III.; duration of pulmonary lesion, 15 years; general condition, unfavorable; digestion, unimpaired; tubercle bacilli, +; hemorrhage, +; laryngeal symptoms, hoarseness; laryngeal involvement, R. cord ulcerated, interarytenoid infiltrated; laryngeal treatment, refused treatment; larynx on discharge, unimproved; lung condition on discharge, quiescent.

Case 30.—Sex, male; age, 31; pulmonary condition on admission, FAC.; involvement, T. III.; side involved, R. III., L. III.; duration of pulmonary lesion, 10 years; general condition, unfavorable; digestion, impaired; tubercle bacilli, +; hemorrhage, —; laryngeal symptoms, sore throat, dysphagia, hoarseness; laryngeal involvement, whole larynx involved, infiltrated; laryngeal treatment, nerve injections; larynx on discharge, unimproved; lung condition on discharge, died.

Case 31.—Sex, male; age, 35; pulmonary condition on admission, MAB.; involvement, T. III.; side involved, R. III., L. I.; duration of pulmonary lesion, 5 years; general condition, favorable; digestion, unimpaired; tubercle bacilli, +; hemorrhage, —; laryngeal symptoms, hoarseness; laryngeal involvement, infiltration L. false cord, also R. cord; laryngeal treatment, routine; larynx on discharge, improved; lung condition on discharge, quiescent.

Case 32.—Sex, female; age, 25; pulmonary condition on admission, FAC.; involvement, T. III.; side involved, R. III., L. II.; duration of pulmonary lesion, 1 year; general condition, unfavorable; digestion, unimpaired; tubercle bacilli, +; hemorrhage, —; laryngeal symptoms, hoarseness; laryngeal involvement, interarytenoid infiltration, also R. cord; laryngeal

treatment, routine; larynx on discharge, unimproved; lung condition on discharge, unimproved.

Case 33.—Sex, male; age, 59; pulmonary condition on admission, FAC.; involvement, T. III.; side involved, R. III., L. II.; duration of pulmonary lesion, 18 mo.; general condition, unfavorable; digestion, impaired; tubercle bacilli, +; hemorrhage, —; other complications, toxic myocarditis; laryngeal symptoms, hoarseness, dysphagia, 6 mo.; laryngeal involvement, infiltration with superficial ulceration throughout larynx, epiglottis ulcerated; laryngeal treatment, amputation epiglottis, routine; larynx on discharge, unimproved; lung condition on discharge, died.

Case 34.—Sex, male; age, 26; pulmonary condition on admission, MAB.; involvement, R. III., L. I.; side involved, T. II.; duration of pulmonary lesion, 5 years; general condition, unfavorable; digestion, unimpaired; tubercle bacilli, +; hemorrhage, —; laryngeal symptoms, hoarseness, 3 mo.; laryngeal involvement, true cords and left arytenoid infiltrated; laryngeal treatment, cautery; laryngeal condition on discharge, A.; lung condition on discharge, unimproved.

Case 35.—Sex, female; age, 34; pulmonary condition on admission, FAB.; involvement, R. III., L. III.; side involved, T. III.; duration of pulmonary lesion, 10 mo.; general condition, unfavorable; digestion, unimpaired; tubercle bacilli, +; hemorrhage, —; laryngeal symptoms, none; laryngeal involvement, interarytenoid infiltration; laryngeal treatment, cautery; laryngeal condition on discharge, unimproved; lung condition on discharge, unimproved.

Case 36.—Sex, female; age, 29; pulmonary condition on admission, FAC.; involvement, R. II., L. II.; side involved, T. III.; duration of pulmonary lesion, 3 years; general condition, unfavorable; digestion, unimpaired; tubercle bacilli, +; hemorrhage, —; other complications, enteritis, colitis, hoarseness, dryness, dysphagia, interarytenoid ulceration, each cord ulcerated, upper border epiglottis ulcerated; laryngeal treatment, amputation; laryngeal condition on discharge, unimproved; lung condition on discharge, died.

Case 37.—Sex, male; age, 25; pulmonary condition on admission, AC.; involvement, R. III., L. III.; side involved, T. III.; duration of pulmonary involvement, 8 years; general con-

dition, unfavorable; digestion, unimpaired; tubercle bacilli, +; hemorrhage, —; other complications, enteritis, colitis, hoarseness following gassing, dysphagia, whole larynx infiltrated and ulcerated, including epiglottis; laryngeal treatment, amputation; laryngeal condition on discharge, unimproved; lung condition on discharge, unimproved.

Case 38.—Sex, female; age, 26; pulmonary condition on admission, FAC.; involvement, R. II., L. III.; side involved, T. III.; duration of pulmonary lesion, 6 years; general condition, unfavorable; digestion, impaired; tubercle bacilli, +; hemorrhage, +; other complications, enteritis colitis; laryngeal symptoms, hoarseness; laryngeal involvement, whole larynx infiltrated, ulceration of cords; laryngeal treatment; routine; laryngeal condition on discharge, unimproved; lung condition on discharge, died.

Case 39.—Sex, female; age, 24; pulmonary condition on admission, FAC.; involvement, T. III.; side involved, R. III., L. III.; duration of pulmonary lesion, 4 years; general condition, unfavorable; digestion, unimpaired; tubercle bacilli, +; hemorrhage, —; other complications, myocarditis; laryngeal symptoms, hoarseness, 3 mo.; laryngeal involvement, infiltration of interarytenoid space, both arytenoid and R. true cord; laryngeal treatment, routine; larynx on discharge, unimproved; lung condition on discharge, died.

Case 40.—Sex, female; age, 23; pulmonary condition on admission, FAB.; involvement, T. III.; side involved, R. III., L. III.; duration of pulmonary lesion, 10 mo.; general condition, unfavorable; digestion, unimpaired; tubercle bacilli, +; hemorrhage, +; other complications, enteritis colitis; laryngeal symptoms, hoarseness; laryngeal involvement, infiltration L. arytenoid and inter.; laryngeal treatment, cautery; larynx on discharge, unimproved; lung condition on discharge, died.

Case 41.—Sex, male; age, 30; pulmonary condition on admission, MAA.; involvement, T. I.; side involved, R. II., L. I.; duration of pulmonary lesion, 4 years; general condition, favorable; digestion, unimpaired; tubercle bacilla, +; hemorrhage, +; laryngeal symptoms, none; laryngeal involvement, ulceration T. cord, infiltration S. arytenoid; laryngeal treatment, curette, cautery; larynx on discharge, unimproved; lung condition on discharge, died.

Case 42.—Sex, female; age, 34; pulmonary condition on admission, FAA.; involvement, T. II.; side involved, R. I., L. II.; general condition, unfavorable; digestion, unimpaired; tubercle bacilli, +; hemorrhage, —; laryngeal symptoms, none; laryngeal involvement, epiglottis infiltration, interarytenoid infiltration; laryngeal treatment, curette, cautery; larynx on discharge, A.; lung condition on discharge, quiescent.

Case 43.—Sex, female; age, 34; pulmonary condition on admission, FAB.; involvement, T. II.; side involved, R. III., L. I.; duration of pulmonary lesion, 12 years; general condition, unfavorable; digestion, unimpaired; tubercle bacilli, +; hemorrhage, +; laryngeal symptoms, slight hoarseness; laryngeal involvement, interarytenoid tuberculoma; laryngeal treatment, amputation; larynx on discharge, improved; lung condition on discharge, improved.

Case 44.—Sex, female; age, 34; pulmonary condition on admission, FAC.; involvement, T. III.; side involved, R. III., L. III.; duration of pulmonary lesion, 16 years; general condition, unfavorable; digestion, impaired; tubercle bacilli, +; hemorrhage, +; laryngeal symptoms, huskiness, dysphagia; laryngeal involvement, epiglottis infiltration and ulceration whole of left side, larynx invo.; laryngeal treatment, amputation; larynx on discharge, A.; lung condition on discharge, quiescent.

Case 45.—Sex, female; age, 34; pulmonary condition on admission, FAB.; involvement, T. III.; side involved, R. III., L. III.; duration of pulmonary lesion, 2 years; general condition, unfavorable; digestion, unimpaired; tubercle bacilli, +; hemorrhage, +; other complications, enteritis colitis; laryngeal symptoms, hoarseness, dysphagia; laryngeal involvement, marked infiltration of arytenoid; laryngeal treatment, cautery; larynx on discharge, unimproved; lungs on discharge, died.

Case 46.—Sex, female; age, 30; pulmonary condition on admission, MAB.; involvement, T. II.; side involved, R. I., L. III.; duration of pulmonary lesion, 2 years; general condition, unfavorable; digestion, unimpaired; tubercle bacilli, +; hemorrhage, +; other complications, T. B. append pluer; laryngeal symptoms, effusion, hoarseness; laryngeal involvement, interarytenoid space and L. arytenoid; laryngeal treat-

ment, cautery; larynx on discharge, unimproved; lungs on discharge, died.

Case 47.—Sex, female; age, 28; pulmonary condition on admission, FAC.; involvement, T. III.; side involved, R. III., L. II.; duration of pulmonary lesion, 1 year; general condition, unfavorable; digestion, impaired; tubercle bacilli, —; hemorrhage, —; laryngeal treatment, routine; larynx on discharge, unimproved; lungs on discharge, died.

Case 48.—Sex, female; age, 31; pulmonary condition on admission, MAB.; involvement, T. II.; side involved, R. II., L. II.; duration of pulmonary lesion, 2 years; general condition, unfavorable; digestion, unimpaired; tubercle bacilli, +; hemorrhage, —; other complications, pregnancy; laryngeal symptoms, hoarseness; laryngeal involvement, infiltration and ulceration epiglottis, edema; laryngeal treatment, none; larynx on discharge, unimproved; lungs on discharge, died.

Case 49.—Sex, male; age, 51; pulmonary condition on admission, FAB.; involvement, T. III.; side involved, R. II., L. I.; duration of pulmonary lesion, 12 years; general condition, unfavorable; digestion, unimpaired; tubercle bacilli, +; hemorrhage, —; laryngeal symptoms, dysphagia; laryngeal involvement, ulceration each vocal cord; laryngeal treatment, cautery; larynx on discharge, A.; lungs on discharge, improved.

Case 50.—Sex, male; age, 49; pulmonary condition on admission, FAB.; involvement, T. III.; side involved R. III., L. III.; duration of pulmonary lesion, 10 mo.; general condition, unfavorable; digestion, unimpaired; tubercle bacilli, +; hemorrhage, —; laryngeal symptoms, hoarseness; laryngeal involvement, false cords; laryngeal treatment, routine; larynx on discharge, unimproved; lungs on discharge, unimproved.

Case 51.—Sex, female; age, 28; pulmonary condition on admission, FAC.; involvement, T. III.; side involved, R. II., L. III.; duration of pulmonary lesion, 2 years; general condition, unfavorable; digestion, unimpaired; tubercle bacilli, +; hemorrhage, —; laryngeal treatment, routine; larynx on discharge, unimproved; lungs on discharge, died.

Case 52.—Sex, female, age, 35; pulmonary condition on admission, MAA.; involvement, T. III.; side involved, R. II., L. II.; duration of pulmonary lesion, 1 year; general condition, unfavorable; digestion, impaired; tubercle bacilli, +;

hemorrhage, —; laryngeal symptoms, hoarse, 6 mo.; laryngeal treatment, cautery; laryngeal involvement, ulcer false cord, 1f arytenoid swollen; larynx on discharge, improved; lung condition on discharge, unimproved.

Case 53.—Sex, female; age, 28; pulmonary condition on admission, FAB.; involvement, T. III.; side involved, R. III., L. I.; duration of pulmonary lesion, 18 mo.; general condition, unfavorable; digestion, unimpaired; tubercle bacilli, +; hemorrhage, —; laryngeal symptoms, hoarseness; laryngeal treatment, cautery; laryngeal involvement, interarytenoid infiltration; larynx on discharge, unimproved; lung condition on discharge, unimproved.

Case 54.—Sex, male; age, 59; pulmonary condition on admission, FAA.; involvement, T. II.; side involved, R. II., L. II.; duration of pulmonary lesion, 3 years; general condition, unfavorable; digestion, unimpaired; tubercle bacilli, +; hemorrhage, —; laryngeal symptoms, hoarseness; laryngeal treatment, routine; laryngeal involvement, ulceration each cord; larynx on discharge, unimproved; lung condition on discharge, unimproved.

Case 55.—Sex, female; age, 19; pulmonary condition on admission, MAB.; involvement, T. III.; side involved, R. III., L. I.; duration of pulmonary lesion, 5 years; general condition, unfavorable; digestion, impaired; tubercle bacilli, +; hemorrhage, +; laryngeal symptoms, none; laryngeal treatment, cautery; laryngeal involvement, false cords; larynx on discharge, improved; lung condition on discharge, unimproved.

Case 56.—Sex, female; age, 34; pulmonary condition on admission, FAC.; involvement, T. III.; side involved, R. III., L. II.; duration of pulmonary lesion, 19 years; general condition, unfavorable; digestion, impaired; tubercle bacilli, +; hemorrhage, —; other complications, pregnancy; laryngeal symptoms, none; laryngeal treatment, amputation; larynx on discharge, unimproved; lung condition on discharge, died.

Case 57.—Sex, male; age, 17; pulmonary condition on admission, FAB.; involvement, T. III.; side involved, R. III., L. II.; duration of pulmonary lesion, 10 years; general condition, unfavorable; digestion, unimpaired; tubercle bacilli, +; hemorrhage, +; laryngeal treatment, cautery; laryngeal in-

volvement, interarytenoid; larynx on discharge, unimproved; lung condition on discharge, improved.

Case 58.—Sex, male; age, 24; pulmonary condition on admission, FAB.; involvement, T. III.; side involved, R. II., L. II.; duration of pulmonary lesion, 5 mo.; general condition, unfavorable; digestion, impaired; tubercle bacilli, +; hemorrhage, —; other complications, enteritis; laryngeal treatment, cautery; laryngeal involvement, ulceration; larynx on discharge, unimproved; lung condition on discharge, died.

Case 59.—Sex, female; age, 25; pulmonary condition on admission, MAB.; involvement, T. II.; side involved, R. II., L. II.; duration of pulmonary lesion, 1 year; general condition, unfavorable; digestion, unimpaired; tubercle bacilli, +; hemorrhage +; other complications, arthritis; laryngeal symptoms, none; laryngeal involvement, interarytenoid infiltration; laryngeal treatment, cautery; larynx on discharge, improved; lung condition on discharge, unimproved.

Case 60.—Sex, female; age, 28; pulmonary condition on admission, FAC.; involvement, T. II.; side involved, R. III., L. III.; duration of pulmonary lesion, 9 mo.; general condition, unfavorable; digestion, impaired; tubercle bacilli, +; hemorrhage, —; other complications, none; laryngeal symptoms, hoarseness; laryngeal involvement, erosion epiglottis; laryngeal treatment, routine; larynx on discharge, unimproved; lung condition on discharge, died.

Case 61.—Sex, male; age, 36; pulmonary condition on admission, FAB.; involvement, T. III.; side involved, R. III., L. III.; duration of pulmonary lesion, 1 year; general condition, unfavorable; digestion, unimpaired; tubercle bacilli, +; hemorrhage, —; other complications, arthritis; laryngeal symptoms, hoarseness; laryngeal involvement, L. cord ulceration; laryngeal treatment, routine; larynx on discharge, improved; lung condition on discharge, unimproved.

Case 62.—Sex, female; age, 40; pulmonary condition on admission, FAB.; involvement, T. III.; side involved, R. I., L. III.; duration of pulmonary lesion, 20 years; general condition, unfavorable; digestion, unimpaired; tubercle bacilli, +; hemorrhage, +; other complications, arthritis; laryngeal symptoms, hoarseness; laryngeal involvement, L. cord ulceration;

laryngeal treatment, cautery; larynx on discharge, unimproved; lung condition on discharge, unimproved.

Case 63.—Sex, male; age, 35; pulmonary condition on admission, FAC.; involvement, T. III.; side involved, R. III., L. III.; duration of pulmonary lesion, 8 mo.; general condition, unfavorable; digestion, impaired; tubercle bacilli, +; hemorrhage, —; laryngeal symptoms, hoarseness; laryngeal involvement, epiglottis infiltration; laryngeal treatment, routine; larynx on discharge, unimproved; lung condition on discharge, died.

Case 64.—Sex, male; age, 17; pulmonary condition on admission, FAC.; involvement, T. III.; side involved, R. II., L. III.; duration of pulmonary lesion, 1 year; general condition, unfavorable; digestion, impaired; tubercle bacilli, +; hemorrhage, +; other complications, T. B. hip, epiglottis; laryngeal symptoms, hoarseness; laryngeal involvement, whole larynx infiltrated; laryngeal treatment, nerve injection; larynx on discharge, unimproved; lung condition on discharge, died.

Case 65.—Sex, female; age, 22; pulmonary condition on admission, FAB.; involvement, T. II.; side involved, R. II., L. I.; duration of pulmonary lesion, 8 mo.; general condition, unfavorable; digestion, unimpaired; tubercle bacilli, —; hemorrhage, +; other complications, arthritis colitis; laryngeal symptoms, pain in throat and hoarseness; laryngeal involvement, epiglottis thickened; laryngeal treatment, amputation; larynx on discharge, unimproved; lung condition on discharge, died.

Case 66.—Sex, female; age, 31; pulmonary condition on admission, FAC.; involvement, T. III.; side involved, R. III., L. III.; duration of pulmonary lesion, 5 years; general condition, unfavorable; digestion, impaired; tubercle bacilli, +; hemorrhage, —; laryngeal symptoms, hoarseness; laryngeal involvement, ulcer R. vocal cord, R. false cord, R. arytenoid; laryngeal treatment, routine; larynx on discharge, unimproved; lung condition on discharge, died.

Case 67.—Sex, male; age, 43; pulmonary condition on admission, FAC.; involvement, T. III.; side involved, R. III., L. III.; duration of pulmonary lesion, 1 year; general condition, unfavorable; digestion, impaired; tubercle bacilli, +; hemorrhage, —; laryngeal symptoms, hoarseness; laryngeal in-

volverment, ulceration R. cord, infiltration R. arytenoid; laryngeal treatment, routine; larynx on discharge, unimproved; lung condition on discharge, died.

Case 68.—Sex, male; age, 35; pulmonary condition on admission, FAC.; involvement, T. III.; side involved, R. III., L. II.; duration of lesion, 2 years; general condition, unfavorable; digestion, impaired; tubercle bacilli, +; hemorrhage, —; laryngeal symptoms, hoarseness; laryngeal involvement, R. arytenoid; laryngeal treatment, tracheotomy; larynx on discharge, unimproved; lung condition on discharge, died.

Case 69.—Sex, female; age, 36; pulmonary condition on admission, MAB.; involvement, T. III.; side involved, R. II., L. III.; duration of pulmonary lesion, 7 mo.; general condition, favorable; digestion, unimpaired; tubercle bacilli, +; hemorrhage, —; other complications, arthritis colitis; laryngeal symptoms, none; laryngeal involvement, arytenoid and cords infiltrated and edematous; laryngeal treatment, routine; larynx on discharge, unimproved; lung condition on discharge, died.

Case 70.—Sex, male; age, 23; pulmonary condition on admission, FAB.; involvement, T. III.; side involved, R. III., L. II.; duration of pulmonary lesion, 3 years; general condition, unfavorable; digestion, unimpaired; tubercle bacilli, +; hemorrhage, —; laryngeal symptoms, none; laryngeal treatment, cautery; larynx on discharge, unimproved; lung condition on discharge, unimproved.

Case 71.—Sex, male; age, 50; pulmonary condition on admission, MAB.; involvement, T. II.; side involved, R. II., L. II.; duration of pulmonary lesion, 1 year; general condition, favorable; digestion, unimpaired; tubercle bacilli, +; hemorrhage, —; laryngeal symptoms, none; laryngeal involvement, interarytenoid infiltration and each arytenoid; laryngeal treatment, cautery; larynx on discharge, A.; lung condition on discharge, quiescent.

Case 72.—Sex, male; age, 50; pulmonary condition on admission, FAB.; involvement, T. III.; side involved, R. III., L. II.; duration of pulmonary lesion, 4 mo.; general condition, unfavorable; digestion, unimpaired; tubercle bacilli, +; hemorrhage, —; laryngeal symptoms, none; laryngeal involvement, infiltration arytenoid, infiltr. and dach. arytenoid; larynx

geal treatment, curette; larynx on discharge, unimproved; lung condition on discharge, improved.

Case 73.—Sex, male; age, 20; pulmonary condition on admission, MAB.; involvement, T. II.; side involved, R. II., L. I.; duration of pulmonary lesion, 6 mo.; general condition, favorable; digestion, unimpaired; tubercle bacilli, +; hemorrhage, +; laryngeal symptoms, none; laryngeal involvement, tuberculoma interarytenoid; laryngeal treatment, curette; larynx on discharge improved; lung condition on discharge, unimproved.

Case 74.—Sex, male; age, 27; pulmonary condition on admission, MAA.; involvement, T. III.; side involved, R. I., L. I.; duration of pulmonary lesion, 18 mo.; general condition, favorable; digestion, unimpaired; tubercle bacilli, +; hemorrhage, +; other complications, arytenoid false cords and both walls of larynx infiltrated, ulceration interarytenoid; laryngeal symptoms, hoarseness; laryngeal involvement, arytenoid false cords; laryngeal treatment, cautery; larynx on discharge, improved; lungs on discharge, improved.

Case 75.—Sex, male; age, 18; pulmonary condition on admission, MAB.; involvement, T. III.; side involved, R. II., L. II.; duration of lesion, 3 years; general condition, unfavorable; digestion, impaired; tubercle bacilli, —; hemorrhage, +; laryngeal symptoms, none; larynx on discharge, improved; lungs on discharge, improved.

Case 76.—Sex, female; age, 37; pulmonary condition on admission, FAA.; involvement, T. III.; side involved, R. III., L. II.; duration of lesion, 9 years; general condition, unfavorable; digestion, unimpaired; tubercle bacilli, +; hemorrhage, —; other complications, infiltration interarytenoid space; laryngeal symptoms, hoarseness; laryngeal involvement, infiltration interarytenoid of t. cords; laryngeal treatment, cautery; larynx on discharge, A.; lungs on discharge, died.

Case 77.—Sex, female; age, 37; pulmonary condition on admission, FAB.; involvement, T. III.; side involved, R. III., L. III.; duration of lesion, 8 mo.; general condition, unfavorable; digestion, unimpaired; tubercle bacilli, +; hemorrhage, —; other complications, cords rough, ulcerated, infiltrated; laryngeal symptoms, huskiness; laryngeal involvement, cords

rough, ulcerated; laryngeal treatment, cauter; larynx on discharge, unimproved; lungs on discharge, died.

Case 78.—Sex, female; age, 34; pulmonary condition on admission, FAC.; involvement, T. III.; side involved, R. III., L. II.; duration of lesion, 16 years; general condition, unfavorable; digestion, unimpaired; tubercle bacilli, +; hemorrhage, —; other complications, ulcerated epiglottis; laryngeal symptoms, hoarseness; laryngeal involvement, ulcerated epiglottis; laryngeal treatment, cauter; larynx on discharge, unimproved; lungs on discharge, died.

Case 79.—Sex, male; age, 37; pulmonary condition on admission, FAB.; involvement, T. III.; side involved, R. III., L. II.; duration of lesion, 12 years; general condition, unfavorable; digestion, unimpaired; tubercle bacilli, +; hemorrhage, —; other complications, R. arytenoid and R. false cord ulcerated; laryngeal symptoms, hoarseness; laryngeal involvement, R. false cord; laryngeal treatment, amputation epiglottis; larynx on discharge, unimproved; lungs on discharge, died.

Case 80.—Sex, male; age, 44; pulmonary condition on admission, FAC.; involvement, T. III.; side involved, R. III., L. III.; duration of lesion, 1 year; general condition, unfavorable; digestion, unimpaired; tubercle bacilli, +; hemorrhage, +; other complications, infiltration true cords and interarytenoid space; laryngeal symptoms, none; laryngeal involvement, infiltrated interarytenoid; laryngeal treatment, cauter; larynx on discharge, unimproved; lungs on discharge, died.

Case 81.—Sex, male; age, 38; pulmonary condition on admission, FAB.; involvement, T. III.; side involved, R. II., L. III.; duration of lesion, 8 mo.; general condition, unfavorable; digestion, unimpaired; tubercle bacilli, —; hemorrhage, +; laryngeal involvement, tuberculoma base of epiglottis; laryngeal treatment, cauter; larynx on discharge, improved; lungs on discharge, quiescent.

Case 82.—Sex, male; age, 38; pulmonary condition on admission, FAA.; involvement, T. II.; side involved, R. II., L. I.; duration of lesion, 1 year; general condition, unfavorable; tubercle bacilli, +; hemorrhage, —; laryngeal involvement,

left half infiltrated; laryngeal treatment, amputation; larynx on discharge, improved; lungs on discharge, improved.

Case 83.—Sex, male; age, 40; pulmonary condition on admission, MA.; involvement, T. III.; side involved, R. III., L. I.; duration of lesion $2\frac{1}{2}$ years; general condition, favorable; digestion, unimpaired; tubercle bacilli, —; hemorrhage, —; laryngeal involvement, L. cord thickened and red; laryngeal treatment, cautery; larynx on discharge, A.; lungs on discharge, quiescent.

Case 84.—Sex, male; age, 32; pulmonary condition on admission, FAB.; involvement, T. III.; side involved, R. III., L. II.; duration of lesion, 3 years; general condition, unfavorable; digestion, unimpaired; tubercle bacilli, +; hemorrhage, —; laryngeal symptoms, hoarseness; laryngeal involvement, interarytenoid infiltration; laryngeal treatment, cautery; larynx on discharge, unimproved; lungs on discharge, unimproved.

Case 85.—Sex, female; age, 34; pulmonary condition on admission, FAC.; involvement, T. III.; side involved, R. II., L. III.; duration of lesion, 1 year; general condition, unfavorable; digestion, unimpaired; tubercle bacilli, +; hemorrhage, —; laryngeal symptoms, hoarseness; laryngeal involvement, interarytenoid infiltration; laryngeal treatment, nerve injection; larynx on discharge, unimproved; lungs on discharge, died.

Case 86.—Sex, female; age, 28; pulmonary condition on discharge, FAC.; involvement, T. III.; side involved, R. III., L. III.; duration of lesion, 15 years; general condition, unfavorable; digestion, impaired; tubercle bacilli, +; hemorrhage, +; laryngeal symptoms, hoarseness; laryngeal involvement, infiltration interarytenoid; laryngeal treatment, routine; larynx on discharge, unimproved; lungs on discharge, died.

Case 87.—Sex, female; age, 36; pulmonary condition on admission, FAA.; involvement, T. II.; side involved, R. I., L. I.; duration of lesion, 5 mo.; general condition, unfavorable; digestion, unimpaired; tubercle bacilli, +; hemorrhage, +; laryngeal symptoms, hoarseness; laryngeal involvement, false cords; laryngeal treatment, cautery; larynx on discharge, unimproved; lungs on discharge, unimproved.

Case 89.—Sex, female; age, 45; pulmonary condition on admission, FAC.; involvement, T. III.; side involved, R.

III., L. II.; duration of lesion, 4 mo.; general condition, unfavorable; digestion, unimpaired; tubercle bacilli, +; hemorrhage, —; laryngeal symptoms, aphonia 2 mo., cough 5 mo.; laryngeal involvement, small tuberculoma interarytenoid space, infiltration both false cords; laryngeal treatment, routine; larynx on discharge, unimproved; lungs on discharge, unimproved.

Case 90.—Sex, female; age, 28; pulmonary condition on admission, FAA.; involvement, T. III.; side involved, R. II., L. II.; duration of lesion, 7 mo.; general condition, favorable; digestion unimpaired; tubercle bacilli, +; hemorrhage, —; laryngeal symptoms, huskiness; laryngeal involvement, posterior end Rt. cord ulcerated, slight interarytenoid infiltration; laryngeal treatment, curette; larynx on discharge, A.; lungs on discharge, improved.

Case 91.—Sex, female; age, 22; pulmonary condition on admission, MAC.; involvement, T. II.; side involved, R. II., L. I.; duration of lesion, 5 mo.; general condition, unfavorable; digestion, unimpaired; tubercle bacilli, +; hemorrhage, —; laryngeal symptoms, hoarseness 4 mo., dysphagia 5 mo.; laryngeal involvement, infiltration with ulceration throughout larynx, epiglottis thickened and ulcerated; laryngeal treatment, amputation epiglottis, injection sup. laryngeal nerves; larynx on discharge, unimproved; lungs on discharge, unimproved.

Case 92.—Sex, male; age, 29; pulmonary condition on admission, FAC.; involvement, T. III.; side involved, R. III., L. I.; duration of lesion, 18 mo.; general condition, unfavorable; digestion, unimpaired; tubercle bacilli, +; hemorrhage, +; laryngeal symptoms, hoarseness 7 mo., cough; laryngeal involvement, infiltration each border in cord, infiltration with superficial ulceration space; laryngeal treatment, curette and cautery; larynx on discharge, improved; lungs on discharge, improved.

Case 93.—Sex, male; age, 32; pulmonary condition on admission, FAB.; involvement, T. III.; side involved, R. III., L. II.; duration of lesion, 3 years; general condition, G. favorable; digestion, unimpaired; tubercle bacilli, +; hemorrhage, +; laryngeal symptoms, none; laryngeal involvement, posterior end each cord infiltrated with ulceration left cord,

interarytenoid space; laryngeal treatment, curette and cautery; larynx on discharge, unimproved; lungs on discharge, unimproved.

Case 94.—Sex, male; age, 24; pulmonary condition on admission, FAC.; involvement, T. II.; side involved, R. III., L. II.; duration, 9 mo.; general condition, unfavorable; digestion, impaired; tubercle bacilli, +; hemorrhage, +; laryngeal symptoms, hoarseness; laryngeal involvement, ulceration interarytenoid space, true cord infiltrated; laryngeal treatment, routine; larynx on discharge, improved; lungs on discharge, improved.

Case 95.—Sex, male; age, 29; pulmonary condition on admission, FAC.; involvement, T. III.; side involved, R. II., L. III.; duration of lesion, 4 years; general condition, G. favorable; digestion, unimpaired; tubercle bacilli, +; hemorrhage, +; other complications, induced phenorrhax; laryngeal symptoms, none; laryngeal involvement, infiltration each arytenoid and interarytenoid space; laryngeal treatment, cautery; larynx on discharge, A.; lungs on discharge, quiescent.

Case 96.—Sex, male; age, 37; pulmonary condition on admission, MAB.; involvement, T. II.; side involved, R. II., L. II.; duration, 2 years; general condition, G. favorable; digestion, unimpaired; tubercle bacilli, +; hemorrhage, +; laryngeal symptoms, hoarseness 1 year, followed by hemoptysis, cough; laryngeal involvement, cough, larynx infiltrated throughout, slight thickening superior border of epiglottis, infiltration of true and false cords, interarytenoid space; laryngeal treatment, routine; larynx on discharge, unimproved; lungs on discharge, improved.

Case 97.—Sex, female; age, 46; pulmonary condition on admission, FAB.; involvement, T. III.; side involved, R. II., L. III.; duration of lesion, 15 years; general condition, unfavorable; digestion, unimpaired; tubercle bacilli, +; hemorrhage, +; laryngeal symptoms, hoarseness, dysphagia; laryngeal involvement, epiglottis infiltrated, also right false cord; laryngeal treatment, amputation; larynx on discharge, unimproved; lungs on discharge, unimproved.

Case 98.—Sex, female; age, 29; pulmonary condition on admission, FAC.; involvement, T. III.; side involved, R. III., L. III.; duration of lesion, 6 mo.; general condition, unfavora-

ble; digestion, unimpaired; tubercle bacilli, +; hemorrhage, —; other complications, tuberculous vulgaris, T. B. salpingitis right; laryngeal symptoms, T. B. tonsil, hoarseness, dysphagia; laryngeal involvement, true cords infiltrated, infiltration and ulceration of interarytenoid space; laryngeal treatment, routine; larynx on discharge, unimproved; lungs on discharge, improved.

Case 99.—Sex, female; age, 15; pulmonary condition on admission, FAB.; involvement, T. III.; side involved, R. II., L. I.; duration of lesion, 10 mo.; general condition, unfavorable; digestion, unimproved; tubercle bacilli, +; hemorrhage, —; laryngeal symptoms, hard palate, hoarseness and cough; laryngeal involvement, epiglottis right infiltrated, tuberculoma interarytenoid space; laryngeal treatment, cautery; larynx on discharge, unimproved; lungs on discharge, improved.

Case 100.—Sex, female; age, 35; pulmonary condition on admission, FAB.; involvement, T. III.; side involved, R. III., L. III.; duration of lesion, 7 mo.; general condition, unfavorable; digestion, unimpaired; tubercle bacilli, +; hemorrhage, —; laryngeal symptoms, hoarseness; laryngeal involvement, tuberculoma interarytenoid space, ulceration right true cord; laryngeal treatment, routine; larynx on discharge, improved; lungs on discharge, unimproved.

Case 101.—Sex, female; age, 21; pulmonary condition on admission, FAC.; involvement, T. III.; side involved, R. II., L. III.; duration of lesion, 5 years; general condition, impaired; digestion, impaired; tubercle bacilli, +; hemorrhage, +; laryngeal symptoms, hoarseness 2 years; laryngeal involvement, ulceration superior border of epiglottis, slight interarytenoid infiltration; laryngeal treatment, amputation; larynx on discharge, A.; lungs on discharge, improved.

Case 102.—Sex, male; age, 29; pulmonary condition on admission, FAB.; involvement, T. III.; side involved, R. III., L. II.; duration of lesion, 1 year; general condition, unimproved; digestion, unimpaired; tubercle bacilli, +; hemorrhage, +; laryngeal symptoms, hoarseness, 4 mo.; laryngeal involvement, thickening of superior border epiglottis, infiltration false cords, interarytenoid space, ulceration posterior end each true cord; laryngeal treatment, patient refused; larynx on discharge, unimproved; lungs on discharge, unimproved.

Case 103.—Sex, female; age, 50; pulmonary condition on admission, FAC.; involvement, T. III.; side involved, R. III., L. III.; duration of lesion, 15 years; general condition, unimproved; digestion, unimpaired; tubercle bacilli, —; hemorrhage, +; laryngeal symptoms, dysphagia, hoarseness; laryngeal involvement, epiglottis infiltrated, true cords ulcerated; laryngeal treatment, amputation; larynx on discharge, unimproved; lungs on discharge, unimproved.

Case 104.—Sex, male; age, 41; pulmonary condition on admission, FAA.; involvement, T. II.; side involved, R. II.; L. III.; duration of lesion, 4 mo.; general condition, unfavorable; digestion, unimpaired; tubercle bacilli, —; hemorrhage, —; laryngeal symptoms, hoarseness 2 mo., much cough; laryngeal involvement, rt. false cord infiltrated, reddened, rt. arytenoid infiltrated; laryngeal treatment, curette; larynx on discharge, A.; lungs on discharge, improved.

Case 105.—Sex, male; age, 32; pulmonary condition on admission, MAA.; involvement, T. III.; side involved, R. III., L. III.; duration of lesion, 3 years; general condition, unfavorable; digestion, unimpaired; tubercle bacilli, +; hemorrhage, +; laryngeal symptoms, hoarseness, 2 years; laryngeal involvement, interarytenoid space infiltrated and ulcerated cord; laryngeal treatment, curette; larynx on discharge, improved; lungs on discharge, improved.

Case 106.—Sex, male; age, 28; pulmonary condition on admission, incip. A.; involvement, T. I.; side involved, R. II., L. I.; duration of lesion, 2 years; general condition, unfavorable; digestion, unimproved; tubercle bacilli, —; hemorrhage, —; laryngeal symptoms, hoarseness; laryngeal involvement, posterior end left cord ulcerated in post., slight infiltration interarytenoid space; laryngeal treatment, curette; larynx on discharge, A.; lungs on discharge, improved.

Case 107.—Sex, female; age, 41; pulmonary condition on admission, FAA.; involvement, T. II.; side involved, R. II., L. III.; duration of lesion, 4 mo.; general condition, unfavorable; digestion, unimpaired; tubercle bacilli, —; hemorrhage, +; other complications, media spinal lymph gland; laryngeal symptoms, hoarseness; laryngeal involvement, right cord infiltrated and ulcerated, in post. one third slight infiltration;

laryngeal treatment, cautery; larynx on discharge, A.; lungs on discharge, A.

Case 108.—Sex, female; age, 32; pulmonary condition on admission, MAA.; involvement, T. III.; side involved, R. III., L. III.; duration of lesion, 3 years; general condition, unfavorable; digestion, unimpaired; tubercle bacilli, —; hemorrhage, —; laryngeal symptoms, none; laryngeal involvement, interarytenoid, ulceration each true cord; laryngeal treatment, curette; larynx on discharge, A.; lungs on discharge, A.

Case 109.—Sex, male; age, 28; pulmonary condition on admission, incip. A.; involvement, T. I.; side involved, R. II., L., 0.; duration of lesion, 2 years; general condition, favorable; digestion, unimpaired; tubercle bacilli, +; hemorrhage, —; laryngeal symptoms, hoarseness and dysphagia; laryngeal involvement, true cords infiltrated, left cord stationary, intery. space infiltrated; laryngeal treatment, curette; larynx on discharge, improved; lungs on discharge, improved.

Case 110.—Sex, female; age, 30; pulmonary condition on admission, incip.; involvement, T. I.; side involved, R. 0., L. II.; duration of lesion, 9 years; general condition, favorable; digestion, unimpaired; tubercle bacilli, +; hemorrhage, +; laryngeal symptoms, hoarseness, 3 mo.; laryngeal involvement, inter. space infiltration and ulceration; laryngeal treatment, routine; larynx on discharge, improved; lungs on discharge, slight improvement.

Case 111.—Sex, female; age, 34; pulmonary condition on admission, FAB.; involvement, T. II.; side involved, T. II., L. I.; duration of lesion, 15 years; general condition, unfavorable; digestion, unimpaired; tubercle bacilli, +; hemorrhage, —; laryngeal symptoms, hoarseness, 4 mo.; laryngeal involvement, infiltration with ulceration of intery. space; laryngeal treatment, curette; larynx on discharge, improved; lungs on discharge, quiescent.

Case 112.—Sex, male; age, 45; pulmonary condition on admission, MA.; involvement, T. II.; side involved, R. III., L. I.; duration of lesion, 3 mo.; general condition, unfavorable; digestion, unimpaired; tubercle bacilli, —; hemorrhage, —; laryngeal symptoms, hoarseness, dysphagia; laryngeal involvement, interarytenoid tuberculoma, infiltration and ulceration true cords and ulceration epiglottis; laryngeal treatment, am-

putation; larynx on discharge, A.; lungs on discharge, quiescent.

Case 113.—Sex, female; age, 29; pulmonary condition on admission, MAB.; involvement, T. II.; side involved, R. II., L. II.; duration of lesion, 8 years; general condition, unfavorable; digestion, unimpaired; tubercle bacilli, +; hemorrhage, +; laryngeal symptoms, hoarseness; laryngeal involvement, interarytenoid space infiltration; laryngeal treatment, curette and cautery; larynx on discharge, improved; lungs on discharge, unimproved.

Case 114.—Sex, female; age, 35; pulmonary condition on admission, MAB.; involvement, T. III.; side involved, R. III., L. II.; duration of lesion, 17 years; general condition, G. favorable; digestion, impaired; tubercle bacilli, +; hemorrhage, +; laryngeal symptoms, hoarseness; laryngeal involvement, infiltration of interarytenoid space and each arytenoid, ulceration true cords; laryngeal treatment, routine; larynx on discharge, unimproved; lungs on discharge, improved.

Case 115.—Sex, female; age, 25; pulmonary condition on admission, incip. A.; involvement, T. I.; side involved, R. I., L. O.; duration of lesion, 4 mo.; general condition, favorable; digestion, unimpaired; tubercle bacilli, —; hemorrhage, —; laryngeal symptoms, slight hoarseness, dryness of throat; laryngeal involvement, arytenoids infiltrated; laryngeal treatment, routine; larynx on discharge, improved; lungs on discharge, improved.

Case 116.—Sex, female; age, 32; pulmonary condition on admission, FAB.; involvement, T. II.; side involved, R. II., L. I.; duration of lesion, 7 mo.; general condition, unfavorable; digestion, unimpaired; tubercle bacilli, +; hemorrhage, —; laryngeal symptoms, hoarseness, 4 mo.; laryngeal involvement, each false cord infiltrated, right more marked, interarytenoid space infiltrated; laryngeal treatment, curette; larynx on discharge, A.; lungs on discharge, quiescent.

Case 117.—Sex, female; age, 22; pulmonary condition on admission, FA.; involvement, T. III.; side involved, R. III., L. II.; duration of lesion, 18 mo.; general condition, unfavorable; digestion, unimpaired; tubercle bacilli, +; hemorrhage, —; laryngeal symptoms, hoarseness, 2 years; laryngeal involvement, interarytenoid infiltration; laryngeal treatment, cu-

rette; larynx on discharge, A.; lungs on discharge, quiescent.

Case 118.—Sex, female; age, 28; pulmonary condition on admission, FAB.; involvement, T. II.; side involved, R. III., L. III.; duration of lesion, 2 years; general condition, unfavorable; digestion, impaired; tubercle bacilli, +; hemorrhage, +; other complications, tuberculous enteritis; laryngeal symptoms, hoarseness, 8 mo.; laryngeal involvement, interarytenoid infiltration, left cord; laryngeal treatment, curette; larynx on discharge, improved; lungs on discharge, improved.

Case 119.—Sex, male; age, 34; pulmonary condition on admission, FAB.; involvement, T. III.; side involved, R. III., L. II.; duration of lesion, 4 years; general condition, G. favorable; digestion, unimpaired; tubercle bacilli, +; hemorrhage, —; laryngeal symptoms, hoarseness; laryngeal involvement, epiglottis infiltration, ulcerated interarytenoid, infiltration left cord; laryngeal treatment, epiglottis removed, arytenoid curettement; larynx on discharge, A.; lungs on discharge, A.A.

Case 120.—Sex, female; age, 52; pulmonary condition on admission, FAV.; involvement, T. III.; side involved, R. II., L. III.; duration of lesion, 7 mo.; general condition, unfavorable; digestion, impaired; tubercle bacilli, —; hemorrhage, —; laryngeal symptoms, hoarseness, 8 mo.; larynx involvement, infiltration of each arytenoid, each true cord; laryngeal treatment, curette and cautery; larynx on discharge, A.; lungs on discharge, A.

Case 121.—Sex, male; age, 44; pulmonary condition on admission, MAB.; involvement, T. II.; side involved, R. III., L. I.; duration of lesion, 2½ years; general condition, unfavorable; digestion, unimpaired; tubercle bacilli, +; hemorrhage, +; laryngeal symptoms, pain right tonsil region; laryngeal involvement, arytenoid infiltrated, ulceration each true cord; laryngeal treatment, routine; larynx on discharge, unimproved; lungs on discharge, improved.

Case 122.—Sex, female; age, 20; pulmonary condition on admission, FAB.; involvement, T. III.; side involved, R. II., L. III.; duration of lesion, 1 year; general condition, unfavorable; digestion, impaired; tubercle bacilli, +; hemorrhage, —; laryngeal symptoms, hoarseness 1 year, dysphagia 1 mo.; larynx involvement, epiglottis infiltrated with deep ulceration,

interarytenoid space infiltrated, cords ulcerated; laryngeal treatment, amputation of epiglottis; larynx on discharge, unimproved; lungs on discharge, unimproved.

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LXII.

NAUSEA AS A NASAL REFLEX.

BY GREENFIELD SLUDER, M. D.,

ST. LOUIS.

Nausea is a symptom of innumerable clinical conditions. It has been mentioned frequently as a symptom of nasal disorders of one kind or another, descriptions of which may be found on perusal of the literature of the past thirty years. It has, however, always been one of a dozen or more symptoms, all of which might have accompanied any acute inflammatory disease with pain.

Nausea, as an isolated specific reflex from the nose, as far as I know, has not hitherto been observed.

My interest in this phenomenon began ten years ago when I injected the nasal (sphenopalatine-Meckel's) ganglion with plain 95 per cent alcohol. It was not uncommon then to produce nausea by that injection. I have seen such a case in which the patient was nauseated instantly by the injection, vomit for six days, intermittently. I have seen this phenomenon also follow the postethmoidal operation. Since I have added carbolic acid to the alcohol injection, nausea has been much less frequent, but still sometimes follows. Frequently, in the throes of severe pain produced by any cause, nausea and vomiting occur, a fact which has been well known probably throughout all time. Anything which will stop the pain under these conditions will stop the nausea. So it has happened that on many occasions a severe nasal ganglion neuralgia has been accompanied by nausea, which ceased with the cessation of the pain by anesthetizing the ganglion. Such cases have been quite frequent in my experience; but within the past year I have had a number where there was not any pain, although the nausea was severe. In one severe nasal neuralgia, on many occasions pain was absent, although a purposeless vomiting had continued for twelve hours, and was stopped in five minutes by the application of one drop of 90

per cent cocain to the nasal ganglion district. This has been repeated many times in this patient.

In another case, one of hyperplastic nonsuppurative sphenoidal headache, marked nausea without headache is sometimes manifest. Applications of one drop of 90 per cent cocain solution to the floor of the sphenoidal cell stops it in about ten minutes. In this cell the Vidian canal may be felt elevated from the floor about one-half centimeter.

These are two anatomic subdivisions of cases which are to be thought of as one type, namely, that of sympathetic nervous system irritations; or at least I should think so. I say this because of the intrasphenoidal cocainization of the Vidian nerve in the Vidian canal. Beyond this, I am unable to speculate as to the mechanism of this apparently well defined reflex.

These observations indicate that the power of making nausea reflex from the nasal ganglion or the Vidian trunk is independent of any pain complement. They suggest, however, that in whatever way the reflex is made it is probably not unrelated to that which makes the pain, inasmuch as it is relieved by cocain locally applied, just as the pain reflex is so stopped. Overdosing with cocain makes nausea return in these cases.

In this association of speculative thought please see "Asthma as a Nasal Reflex," by Greenfield Sluder, M. D., Trans. Am. Med. Assn., Sect. Laryngol., Rhinol. and Otol., 1919.

LXIII.

A CASE OF NODULAR HEADACHE OF NASAL
(SPHENOPALATINE-MECKEL'S) GANGLIONIC
ORIGIN.

BY GREENFIELD SLUDER, M. D.,
ST. LOUIS.

Nodular or rheumatic headache, as it is sometimes called, is not frequent compared to other headaches. It is characterized by the presence of nodules from the size of a pea to that of a hazelnut, in some part of the scalp or the nape of the neck, which are supposed to be the cause of the headache. Sometimes they are spoken of as being found lower down in the shoulders.

The theories of their origin and their relation to the headache and the literature concerning the problem are profuse. Those interested will find much in the monographs on migraine.

The case I report is striking.

A lady, 40 years old, gives a clear history of a "lower-half headache" of great severity from her childhood, stating that when it was very bad "knots" came in her neck and over her scalp. She has been my patient for fifteen years, but I never succeeded in seeing her when the "knots" were present until one month ago. At this time she had an unusually severe attack of nasal ganglion neuralgia, for which she consulted me. She spoke of the severity of the attack and called attention to some "knots" in her neck. At the lowermost part of the occiput were two nodules near the middle line, each side, one centimeter wide, and two centimeters long, tender to touch. Full cocainization of the nasal ganglion relieved the pain, and an hour later the node of the right had disappeared. That of the left side was present 24 hours later, but smaller and less sensitive. It disappeared in ten days more.

These are the cases that are spoken of by massage advocates. Auerbach describes them as constant chronic headaches with nodules. Patrick described them as acute or chronic.

Auerbach cut a specimen of one of them out for microscopic examination but could prove nothing. I cannot help thinking that these nodes are manifestations on the part of the sympathetic not unrelated to some of the skin lesions of neurotic sensory or trophic origin. One case, however, must be remembered merely as one case.

I have seen some cases latterly where the nodules were at the locations of lymphatic glands. In these cases the question arose as to whether they were not in reality lymph glands and that the enlargement was brought about through the sympathetic nervous system.

LXIV.

RESULT OF THE USE OF THE HEAT HYPEREMIA
IN THE ESOPHAGEAL STRICTURE.*

By L. W. DEAN, M. D.,

IOWA CITY, IOWA.

The genitourinary specialists have for many years used heat hyperemia to soften the strictures of the urethra before dilating them. Heat has been applied to the strictured part by the use of bags containing hot water and by using electrically heated bougies.

Since last summer we have been using electrically heated flexible esophageal bougies for dilating fibrous esophageal strictures. This procedure has hastened very much the dilating process. In using these bougies for dilating fibrous strictures we have not confined the action of the heat to the production only of heat hyperemia but have used the heat until an edema was produced. In dilating urethral strictures the edema must be avoided because of the blocking of the urethra by the swollen membrane. In esophageal work a slight edema is of advantage; too much edema will close the esophagus, a condition to be avoided.

These elastic electrical bougies are used as follows: A bougie is selected that will fit tightly in the stricture, using a mouth gag to prevent the patient biting the bougie. It is inserted tightly into the stricture. Before insertion the bougie is warmed to 40 degrees centigrade and is left in place for thirty minutes, the bougie remaining at a constant temperature during this time. When the bougie is removed the strictured area is hyperemic; the fibrous tissue appears moist; it is edematous and softened. The dilation is continued immediately after the removal of the heated bougie with nonheated flexible bougies.

These esophageal bougies are made by V. Mueller & Co.

*Read before the Fourth Annual Meeting of the Association of American Peroral Endoscopists, Atlantic City, June, 1921.

Within the bougie and in contact with its wall is a radiator. The temperature of the radiator is controlled by a light socket controller of the Wappler type. A thermometer is inserted into the current to indicate the temperature of the bougie.

We have secured our best results in old fibrous strictures of adults.

LXV.

DOUBLE MASTOIDITIS; PERISINUS ABSCESS; PRO-
LONGED POSTOPERATIVE TEMPERATURE;
UNUSUAL BLOOD COUNT; RECOVERY
WITHOUT FURTHER OPERATION.

By J. L. MAYBAUM, M. D.,

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Sophie A., age 13 years, was admitted to the Manhattan Eye, Ear and Throat Hospital, April 24, 1920, service of Dr. T. P. Berens, with an acute mastoiditis involving the left ear. Past history as to general and aural disease, negative. There was a history of influenza two months previously, followed by pain in the right ear; ear drum ruptured spontaneously; moderate purulent discharge. She had had considerable pain in the region of the left mastoid for a period of one week before entering the hospital.

Examination on admission: Fairly well nourished, anemic individual. She appeared to be quite ill; temperature, 102; pulse, 84; respirations, 18.

Left ear: Profuse discharge from the middle ear, under tension; small insufficient perforation in left inferior quadrant. Posterior superior wall decidedly sagging. Hearing markedly impaired. Periosteal thickening, extreme tenderness, left mastoid.

Right ear: Slight mucopurulent discharge, perforation in posterior inferior quadrant; drum injected and thickened; landmarks absent excepting short process of the malleus. Hearing function, whisper 10 feet. Resolving right middle ear.

I did a simple mastoidectomy (left) the same evening and found extensively involved mastoid. Free pus under pressure and pale gelatinous granulation throughout. Sigmoid sinus covered with pus and granulations—perisinus abscess.

*Read at the Section on Otology, November 12, 1920.

On the ninth day following the operation on the left mastoid patient began to complain of a recurrence of pain in the right ear. Temperature rose in a few hours from 100 to 104, pulse 90, respirations 22. Right drum bulging and showing small amount of pulsating pus from the perforation in the posterior inferior quadrant.

Although the temperature dropped gradually after the paracentesis and the aural discharge was quite profuse, the pain in the right ear continued during the next twenty-four hours. Slight mastoid tenderness and periosteal thickening. X-ray examination May 2nd, disclosed pus and granulations with beginning bone absorption. The operative findings on the right side differed little from that found at the operation on the left mastoid, except that the perisinus abscess here was smaller in extent and the sinus in the region one-half inch posterior to the knee was covered with granulations. The patient's convalescence from then on was uneventful, and on the 25th of May she left the hospital, returning to the clinic for her dressings. The subsequent course was rather interesting.

On May 29th, she was readmitted to the hospital. She had been feeling well until the evening before, when she became feverish and complained of severe frontal headache. Temperature, 105; pulse, 140; respirations, 24. Dr. Stowell reported general examination, as to heart, lungs and abdomen, negative. Reflexes normal. Both mastoid wounds very satisfactory, showing healthy granulations and slight amount of mucopurulent discharge. During the next two days the temperature fluctuated between 102 and 104 degrees; pulse, 124 to 138; respirations, 24. Two general examinations during this period reported negative. Laboratory reports will be detailed later. On the 7th, 8th, 11th and 24th of June the patient had a distinct sharp rise of temperature, from 99 to 104, 105 and 106 degrees, respectively, followed in each instance by a rapid decline to normal, the third time to sub-normal, within twelve hours. A chill of five minutes' duration, the only one throughout her illness, preceded the second rise of temperature.

There was an interval of twenty-four hours between the first and second rises of temperature. Three days between the second and third elevations of temperature, followed dur-

ing the next two weeks by practically normal temperature, during which the patient's general condition was excellent. There occurred another rise of temperature within a few hours from 100 to 106 degrees and again a rapid decline to normal. From then on the temperature remained within normal limits. The patient left the hospital July 5th, refusing to remain for further observation. At the height of each temperature rise the pulse relative to the temperature was slow, ranging between 100 and 108. Except for general malaise during each elevation of temperature, the patient continued to show a steady improvement in health. The patient returned to the clinic during the next two weeks for her mastoid dressings, at the end of which time she was discharged fully restored to health.

As to laboratory findings: Three blood cultures were taken, showing no growth after fifty-six hours' incubation.

Seven blood counts were made with the following results: May 1, 1919—Leucocytes, 18,600; large mononuclear lymphocytes, 10 per cent; small mononuclear lymphocytes, 2 per cent; polynuclears, 88 per cent. May 2—Leucocytes, 18,200; L. M. L., 10 per cent; S. M. L., 28 per cent; polys., 62 per cent. May 21—Leucocytes, 10,200; L. M. L., 7 per cent; S. M. L., 25 per cent; polys., 68 per cent. June 1, 1919—Leucocytes, 5,600; L. M. L., 40 per cent; S. M. L., 43 per cent; polys., 17 per cent. June 5—Leucocytes, 5,000; L. M. L., 42 per cent; S. M. L., 29 per cent; polys., 28 per cent. June 11—Leucocytes, 7,200; L. M. L., 34 per cent; S. M. L., 8 per cent; polys., 58 per cent. July 3—Leucocytes, 8,400; L. M. L., 28 per cent; S. M. L., 4 per cent; polys., 68 per cent.

The first three blood counts were taken at various times before the first sharp rise of temperature. The second three were taken during the period of temperature rises. The final count was taken ten days after the last temperature elevation. Wassermann, negative. Urine examination, negative. Culture from each mastoid showed streptococcus pyogenes.

A presumptive diagnosis may be made in this case of a sinus thrombosis, the symptoms, considering the various facts in the case, being accounted for by the presence of an aseptic clot in either lateral sinus. The exclusion of any other possible factor responsible for the rises of temperature, together

with the general well being of the patient, and three negative blood culture findings would tend to substantiate this diagnosis.

A possible tubercular process was constantly kept in mind because of the repeated findings of lymphocytosis, but physical examinations failed to disclose anything abnormal.

In children a lymphocytosis not infrequently takes the place of a polynucleosis during infectious processes.

Among the factors influencing me in adopting a conservative attitude in this case as to further surgical interference were:

1. The continued general well being of the patient throughout in spite of her rises of temperature. She could be kept in bed only with the greatest difficulty.
2. The long interval between the third and fourth rises of temperature and the absence of any further rise.
3. Three negative blood cultures.
4. Absence of leucocytosis and polynucleosis, following double mastoidectomy, although typical "sinus thrombosis" temperature rises occurred.

17 EAST 38TH ST.

LXVI.

CAVERNOUS SINUS THROMBOSIS OF OTITIC
ORIGIN.*

By J. L. MAYBAUM, M. D.,

NEW YORK.

Frank L., 12 years of age, was seen by me at the Manhattan Eye, Ear and Throat Hospital, August 15, 1918, service of Dr. T. P. Berens. The history which he gave was as follows: Previous aural history negative. The patient's parents did not recall that the boy had any of the infectious diseases of childhood; was always in good health until two years ago. At that time he was struck by a brick just above the left ear. He was immediately taken to the Presbyterian Hospital, where he was operated upon for fracture of the skull. After remaining at the hospital for three weeks, he returned home practically restored to health. From then until four weeks ago he had been in excellent health. While bathing at the seashore he developed severe pain in the left ear, frontal headache, followed two days later by a profuse aural discharge. He was treated by his physician for a few days and then referred to a general hospital. His ear symptoms subsided somewhat, but he began to have attacks of continued nausea and vomiting; was treated for a few days for a gastrointestinal condition. At the end of five days he was brought to the Manhattan Hospital, complaining on admission of considerable pain in the left ear and mastoid headache. Two chilly attacks during the last thirty-six hours; fever, nausea and vomiting.

On admission the afternoon of August 15th, the patient appeared extremely ill. His temperature was 103, pulse 96, respirations 20. The temperature rose from 100 to 105 degrees in a few hours; pulse, 110; respirations, 24.

Examination of left ear: A large perforation in postero-superior quadrant, from which foul smelling discharge was

*Read at the Section on Otology, November 12, 1921.

escaping. Marked sagging of the superior bony canal wall. There was some edema over the right mastoid and exquisite tenderness, especially over the emissary. Hearing of the right ear very much impaired. No spontaneous nystagmus. Both labyrinths reacted within a minute to caloric stimulation. Pupils react sluggishly. Some rigidity of the neck present. Kernig absent. Knee and abdominal reflexes normal.

Blood count August 15th showed: Leucocytes, 18,500; polynuclears, 84 per cent.

Nothing abnormal was found on thorough physical examination of the heart, lungs and abdomen.

I did a lumbar puncture before operating and withdrew 10 cc. of cloudy spinal fluid under increased pressure.

On operating that evening, I found an extensively involved mastoid. Large perisinus abscess. The sigmoid sinus from the knee down had a dirty yellow grayish appearance, and pus could be seen oozing from an area of the sinus about one-fourth of an inch in diameter near the knee. The sinus exposure was carried back for a distance of more than half way toward the torcular end before normal appearing sinus wall was reached. This part of the sinus was covered with granulations. The usual degree of exposure of the sigmoid sinus at the lower limit was carried out. There were no granulations covering this part of the sinus from the perforated sloughed area to the lower end of the exposure. The sinus wall, however, had a grayish, thickened, lusterless appearance. An extradural abscess was found in the region of the posterior fossa near the knee. Exposure of dura of middle fossa over tegmen antri disclosed nothing abnormal.

A jugular resection was done. The vein was collapsed almost to the clavicular end.

On opening the sinus a partly disintegrated clot was found in the sigmoid sinus—no bleeding from the jugular end. There was a firmer clot in horizontal part of the sinus, upon removal of which free bleeding occurred.

The patient reacted fairly well following the operation. On visiting him the next morning I noticed considerable edema of the left eyelid. Other evidences of a cavernous sinus throm-

bosis soon followed. Exophthalmos became marked. The ocular conjunctiva showed a pronounced chemosis; pupil of left eye dilated and fixed. Because of the dulled sensorium of the patient and rapidly increasing edema of the eyelid, the question of ocular mobility could not be determined. The symptoms which were present previous to operation—evidences of meningeal involvement—continued unabated. Daily fluctuations of temperature between 100 and 104 degrees. The last three days the temperature continued high, remissions being less marked. On the third day following the operation the right eye became similarly involved. The condition grew progressively worse, the patient lapsing into coma, dying the seventh day after his admission to the hospital. No autopsy was permitted.

Laboratory findings: Culture from the mastoid, streptococcus mucosus. Blood culture negative. Cerebrospinal fluid at the time of operation, turbid; sugar absent; trace of albumen, marked degree of lactic acid, contained abundant mononuclear and polynuclear leucocytes. Bacteriologic examination negative.

The findings in the cerebrospinal fluid together with the symptoms on admission would indicate that the patient had on entering the hospital, in addition to a jugular thrombophlebitis, at least a circumscribed purulent meningitis.

The above case of cavernous sinus thrombosis is reported not only because of the comparative rarity of that form of otitic sinus disease, but because of the lesson since then derived from this experience. The prognosis of these cases is recognized to be quite hopeless, because of the inaccessibility of the cavernous sinus to such surgical procedures as are applicable to the lateral sinus.

Wherever in a case of lateral sinus thrombosis the bleeding from the jugular end is absent or where, after the lateral sinus has been opened, clinical evidence of septic absorption continues from a clot on the bulb, the jugular bulb should be opened and drained, provided, however, the general condition of the patient permits of such a procedure. During the past few years Dr. Whiting has repeatedly demonstrated this to be

feasible. I believe he has not as yet published his work along these lines. Dr. Friesner time and again, during the last year, has demonstrated upon the cadaver the comparative ease with which the jugular bulb can be thoroughly opened and drained without endangering the facial nerve. He further enlarges the approach to the bulb by removing the jugular process of the occiput. I have followed this procedure upon the cadaver a considerable number of times during the past year and have myself noted the facility and safety with which this operation can be performed.

17 EAST 38TH ST.

SOCIETY PROCEEDINGS.

THE FORTY-THIRD ANNUAL CONGRESS OF THE AMERICAN LARYNGOLOGICAL ASSO- CIATION, HELD AT ATLANTIC CITY, MAY 30 TO JUNE 1, 1921.

Reported by

EMIL MAYER, M. D., ABSTRACT EDITOR, AND
C. J. IMPERATORI, M. D., ASSISTANT ABSTRACT EDITOR.

President's Address.

After expressing his gratification at the honor bestowed upon him by his election to the presidency of this Association, and introducing the distinguished guests, Dr. Mosher presented the following as part of his presidential address:

The Liver Tunnel and Cardiospasm.

By Harris P. Mosher, M. D.,
Boston, Mass.

Last year I reported the cadaver findings in thirty cases of the injected esophagus and stomach of adults and sixty injected and dissected babies. I have recently supplemented these by clinical observations. One set of findings has proved to supplement the other. The result of my observations can be summed up as follows: First, a free passage through the subdiaphragmatic esophagus depends upon the potency of the liver tunnel; second, in ten cases of cardiospasm of which I have sufficient data to draw conclusions, there was either a partial crescentic stricture, or a full annular stricture at the beginning of the liver tunnel and opposite the upper edge of the left lobe of the liver. So far as my cases go, stricture and not spasm was found to be the chief causative factor. More cases are necessary in order to determine whether or not the high percentage of stricture in cases of cardio spasm which I found is constant.

The basic fact of my paper of last year was that the liver is chiefly responsible for the shape of the lower end of the esophagus. The subdiaphragmatic portion of the esophagus runs in a tunnel of liver, and according to the closeness of the investing liver, is either flaring and trumpet shaped, or narrow and cone shaped. Plates of the lower end of the esophagus often show it ending in a nipple like point. Between this and the fundus of the stomach there is a gap. This gap is the closed liver tunnel. I demonstrated in my last paper that the upper edge of the liver often makes a crease in the front wall of the esophagus, and that this crease is present at birth. The left crus makes a crease in the

posterior wall of the esophagus and a marked notch in its left edge. Experiments on the cadaver show that the crescentic mound which is often seen through the esophagus in the right half of the field as the liver is approached, is made by the upper rim of the liver. I asked Dr. Gordon of the X-Ray Department of the Massachusetts General Hospital to prove, if possible, that the upper border of the liver exerted appreciable pressure on the front surface of the esophagus in the living. The result of our combined observations is that in a majority of normal cases there is an appreciable delay of the bismuth milk at the upper border of the liver when a patient swallows. Dr. Gordon made the further observation that when the diaphragm is lowered the bismuth milk, which is held back momentarily by the liver edge, shoots at once into the stomach. Putting the patient in a position which causes the liver to fall away from the esophagus and so relieving the esophagus of liver pressure, also to make the fluid pass into the stomach more easily.

I have found in the cadaver four specimens of annular stricture of the lower part of the esophagus. Each one caps a circumscribed dilatation of the esophagus, which is bounded below by the constriction caused by the left crus. Each stricture is on a level with the upper edge of the left lobe of the liver.

In three cases of cardiospasm of which I have good records, the diaphragm was moderately lowered in one and markedly lowered in the other two.

In grouping my cases of cardiospasm I find that there is an element of stricture in the majority of them, and this stricture is by preference at the beginning of the liver tunnel at the upper edge of the liver.

The stricture element found in my cases varied from a slight crescentic fold in the right quadrant of the esophagoscope in the region of the hiatus to a full annular stricture with a central opening. In the cases which showed the crescentic fold, steady pressure with the end of the esophagus usually resulted in the tube slipping by into the normal esophagus below and through this into the stomach. The withdrawal of the tube disclosed a vertical slit in the mucous membrane of the esophagus. I have held these cases to be analogous to partial webs at the mouth of the esophagus. I have records of three cases in which there was a full stricture with a central opening. This stricture was at the hiatus, or rather at the upper edge of the liver. On divulsing the stricture with the mechanical dilator a crescentic mounding was seen in the right field. Steady pressure with the tube caused the tube to pass this and enter the subdiaphragmatic esophagus and then continue on into the stomach. This mound I now believe to be the upper edge of the liver.

I have one case which showed a narrowing of the whole length of the liver tunnel. We have, then, as my cases show, strictures at the upper or lower edge of the liver tunnel, or anywhere in its course, or we can have a narrowed liver tunnel or a stiffened tunnel through which the food runs slowly. My observations would seem to show that spasm is a minor element in these cases, that some form of stricture is generally present. I believe that

the strictures are due to some inflammatory process either within the liver tunnel or in the vicinity of the cone of the diaphragm.

What causes these partial and full strictures to form at the upper edge of the liver tunnel? I found one case in which there was healed tubercular process of the lumbar vertebra opposite the upper edge of the liver and opposite the stricture. The fact that in the majority of normal cases the upper edge of the liver causes a momentary delay in swallowing and that the knifelike edge of the liver often markedly indents the front face of the esophagus makes this part of the esophagus vulnerable and subject to trauma. I feel that narrowing of the liver tunnel due to an inflammatory involvement of the lesser omentum will be found in the future to play a large part, if not the greatest part, in producing these strictures connected with cases of cardiospasm. Where does the inflammation originate? It can originate in any part of the peritoneal cavity. Below the diaphragm the peritoneum runs from the lesser curvature of the stomach to the liver, making the lesser omentum and bounding the foramen of Winslow. The subdiaphragmatic esophagus is bathed in this peritoneal tissue. This shares in the inflammations, acute and chronic, of the rest of the peritoneal tissue of the abdominal cavity. When the lesser omentum becomes involved, the liver tunnel becomes less flexible, the liver and diaphragm less mobile, and we have the familiar result which has been styled temporary cardiospasm, that is, there is difficulty in swallowing. It is well known that disease of the gall bladder, cancer of the lesser curvature of the stomach, and if cancer can cause it, ulcer can do the same, and disease of the appendix are associated with cardiospasm. In one of my cases of full stricture the patient, when an infant, swallowed a two-cent piece. In another case, the patient gave a history of general peritonitis twenty years ago.

I have proved to my satisfaction that many of these so-called cases of cardiospasm are mainly cases of stricture of the upper end of the liver tunnel.

Tonsillectomies in Adults for Rheumatism With Critical Review of Results.

By Hill Hastings, M. D.,
Los Angeles, Cal.

Much that has been written of the tonsil operation deals with the surgical technic. Comparatively little has appeared in laryngological literature dealing with clinical problems or the results from the patient's standpoint.

The limitations are:

First. All adult cases in which tonsillectomies were done solely for ear, nose and throat diseased conditions are excluded.

Second. Cases that date back over six years are excluded.

Third. All cases are excluded that are of shorter duration of observation than four months.

Tables are presented showing ages, duration of rheumatism, parts affected, character of rheumatism with results of tonsillectomy, throat history, and subsequent history of 120 cases.

The subsequent results are based on personal examination of the patients by the writer, by the internists or by the orthopedist, and checked up by questionnaires received from all of the 130 cases, except 26 who could not be located. 39.5% were improved. Some of them gradually growing worse, some of the remaining stationary. In this whole series of tonsillectomies there were no hopelessly chronic cases operated, and it would seem that the percentage of "not improved," i.e., 21% should not have been so high; nevertheless, one feels that many of the cases that were marked "improved" might have become hopelessly chronic but for the tonsil surgery. A review of the cases of rheumatism marked "cured" is worth while. Of the 40 cases in which apparent cure resulted, 22 were diagnosed "chronic arthritis mild"; 11 were acute arthritis cases, and 5 were diagnosed "myalgia". A general survey of these cases showed that most of these patients had suffered for years, but not continuously, with pain and stiffness in one or several joints, at times acute and temporarily crippling. A few were crippled for months before operation. Orthopedic measures of various kinds had been tried. A few of them gave a history of symptoms of tonsil trouble; some no history of throat trouble. In 7 cases the history showed an acute tonsillitis as a forerunner of the rheumatism. In other cases an accumulation in a tonsil crypt caused rheumatic symptoms.

It has been the writer's experience to find that adult patients suffering from toxic symptoms are referred to the laryngologist for his decision as to whether or not the tonsil is the seat of a chronic infection. Other patients come with the statements that their tonsils have been pronounced infected or that a culture that has been made from the crypts showed chronic infection. The writer has taken some pains to inform all such patients that every adult's tonsil is a chronic infected tonsil, from which a positive culture can be made. The same is probably true of most tonsils in children. Therefore, the necessity for a tonsillectomy depends not solely upon the examination by a laryngologist, but upon a complete study of the patient to determine all possible factors responsible for the invalidism, rheumatism, heart trouble, etc.

Results of the Treatment by X-Ray and Radium of Diseased Tonsils and Adenoids.

By D. Bryson Delavan, M. D.,
New York City.

Suggestions have recently been made that lymphoid hypertrophies can be radically cured by radiation, both from the X-Ray and from radium. Investigations have been carried on under exceptionally favorable conditions and several interesting results have been obtained.

Whether the presence of pathogenic organisms in the tonsillar crypts is the result of hypertrophy or whether the hypertrophy arises from another set of conditions, there is no question that enlarged tonsils with resultant poorly drained crypts have a pathologic significance. The other lymphoid deposits which occur in various parts of the pharynx, usually at the vault, lateral walls

and base of the tongue, commonly show alterations similar to those found in the tonsil. It has been proved in general that lymph cells are powerfully influenced by radiation, doses very much smaller than those required to affect other tissues being sufficient to destroy them.

To summarize: Very small amounts of X-Ray are sufficient for the reduction of lymphoid tissue, doses so small that no injury, it is claimed, results to other parts from its application. The current used is too weak to affect even the external integument, but sufficiently strong, nevertheless, to destroy the lymphoid tissue, and no scar tissue is left behind. The rays themselves do not destroy bacteria, hence they do not affect concealed abscesses of the tissue. They act by so modifying the crypts that free drainage from them is secured, and thus the crypts continue to empty themselves of all offending contents. As the tonsil atrophies, the infection will disappear from the opening up and drainage of the crypts. The principle of this procedure, long recognized, has been carried out surgically for many years, in many cases with excellent results. Dr. Murphy maintains that little atrophy will result in the case of fibrous tonsils, since the rays have no effect upon fibrous tissue. This being true, such cases must continue to be treated surgically, as heretofore.

Moreover, since radiation does not affect bacteria, its application in cases of concealed chronic abscesses of the tonsil will be ineffective, an unfortunate circumstance, in view of the prevalence of this condition.

That the method of treatment by radiation will quickly come into general use is improbable. The region of the neck is one containing numerous important anatomical structures which must be carefully guarded against injury. All agree that knowledge of the safe and effective use of both X-ray and radium is acquired only through highly intelligent study and much experience. Far better that experiments be carried on by those qualified for the work than that the success of a method of such good promise should be compromised and perhaps discredited through errors due to incomplete understanding of the medium, or to faulty technic in its application. Knowledge of the subject is in its infancy, and far more study and observation are needed to prove the value of the few theories already suggested; but what has already been done has developed questions of greatest interest, not to be settled by theoretical discussion but by painstaking experimentation and accurate scientific observation.

Must It Always Be Tonsillectomy?

By Henry L. Swain, M. D.

New Haven, Conn.

Dr. Swain, having in mind the frequency with which in late years the tonsil was looked upon as the cause of an astonishingly large number of diseases and symptoms affecting the comfort and menacing the lives of patients, and while recognizing the perfectly laudable desire on the part of the operator to get rid of the tonsil—root and branch—felt that we as a profession ought not to leave out of our consideration the fact that there are other methods than

tonsillectomy, which are safe, sane, sure, and enduring in their results, whenever we wished to employ them. These methods did not endanger life, did not subject the patient to the often very distressing effects of serious hemorrhage, avoided the chance of lung abscess, brought the patient out of the affray with undistorted and nonadherent palates, and without even the disturbance of their daily routine of life. From his own experience with a simple method of slitting up intercommunicating crypts and other retention pockets, punching out undesirable tissue areas and, if necessary, shrinking the tonsils by galvanocautery procedures, he was able, very often, by the same process, to prove tonsils guilty, and to make them cease from troubling, achieving frequently as spectacular and permanent results thereby as he or anybody else ever attained by perfect tonsillectomies. While preparing this paper he not only discovered that he was not, as he thought, alone, but many others had had similar results by other means, and had only lately been made acquainted with the brilliant results of work by X-ray exposures.

With all these observations well carried out and thoroughly followed up in his own case for years, he felt that the original question was answered, that it was not always necessary to do a complete tonsillectomy, to remove the threat and menace of the faucial tonsil.

DISCUSSION.

Dr. Joseph L. Goodale, Boston, Mass.: I think that the Society is extremely fortunate in having listened to these three papers, which show that there is still something to be said in regard to the subject of the tonsil. I want to ask Dr. Hastings to tell us whether in these cases it is possible for him to ascertain absolutely whether there has been an unusually large proportion of what we might call anaphylactic types among the twenty per cent of arthritic cases that failed to show improvement? I ask this, because he suggested the hypothesis that certain arthritic cases may conceivably be explained on the ground of previous sensitization of the joints, which, in subsequent infection, were again brought into prominence—not through direct penetration of bacteria, but through toxins generated in the tonsils finding response in the joints. I have myself seen a case of what I have called ingestion anaphylaxis giving rise to arthritis. At the suggestion of the orthopedic surgeon, I tested the patient with various proteids and got a definite reaction to meat and potato. These two articles were then omitted from his dietary; and within ten days the joint symptoms disappeared. He then gave these foods up, and again the joint symptoms disappeared; and he has been well ever since. I have not seen him for a year; but when I last saw him, he was entirely well.

In regard to Dr. Delavan's paper, the cases that we can influence are chiefly the juvenile. In the senile ones, with evident symptoms resulting from absorption, I question whether we can accomplish so much.

Dr. Joseph H. Bryan, Washington, D. C.: My experience is confined to five or six cases. I will report three of these. The others are still under observation. In case 1, the patient, a gentleman,

came down last September with influenza, and then suddenly developed localized pneumonia with endocarditis and nephritis. He was critically ill for a few days, and finally overcame the invasion of bacteria; but he had a marked prostration, which continued for several months. He was unable even to walk to my office, a distance of only three blocks, and had to take a cab. The nephritis continued long after the other complications had cleared up, and while I knew that he had had bad tonsils, it did not appear to me that they might be the cause of the continued nephritic condition. The tonsils were buried in fibrous tissue and examinations of them showed the presence of two kinds of streptococcus, viridans and hemolyticus. The patient received six applications of the X-rays, and the nephritis cleared up completely, although the bacterial contents of the tonsils remained the same. The organisms were not destroyed. The man was a bad surgical risk and could not have had a tonsillectomy performed under local anesthesia on account of the condition of his throat; and he could not have taken a general anesthetic. I do not know whether the good results in this case was due to opening the crypts and increasing the drainage, or to shutting off the lymphatics and preventing invasion of the system by the bacteria from the tonsils; but the case was successful. In the second case, there was marked fibrosis of the tonsils on both sides, with arthritis of the knee. The patient was a woman of sixty-five years, who had refused to have the tonsils taken out, and I was glad that she had come to that decision. I had the X-rays applied. She had marked streptococcus hemolyticus infection. There has been no reduction in the amount of tonsil tissue, so far as we can tell. There may be in the amount of the lymphoid tissue, but the mass as a whole is the same as before; and the organisms are as numerous as formerly. I do not believe that any improvement at all occurred. In the third case, the patient was a lady of seventy-three years who had glaucoma and infected tonsils. The tonsils were small and soft and contained streptococcus hemolyticus and viridans. The X-ray was applied, and the tonsils have been completely absorbed. They were twice the size of a marrowfat pea. The organism has been changed from viridans to hemolyticus. There has been great improvement in her general health and in her eye. We have had remarkable results in this case. I believe that her general health benefit will continue, and the ophthalmologist feels that there is a possibility of further improvement to the eye. Of the other cases, I have had one case in a child of twelve years, who had tonsils and adenoids combined. I am not able to report on that condition yet. I believe that this is a valuable adjunct to our treatment, particularly in selected cases, but I do not believe that it will supplant surgery.

Dr. Cornelius G. Coakley, New York City: About ten days ago, I reported before the New York Academy of Medicine the results of our survey of tonsils that we had operated on during the past twelve years (about one hundred and forty-six) for rheumatism; and our results were above eighty-five per cent of very marked improvement or cure. It is very disappointing, especially in a case of acute polyarthritis, to find that some patients will have acute polyarthritis in spite of complete enucleation of the tonsil

and as much of the lymphoid tissue as possible. With reference to the use of the X-ray on the tonsil, if there are fifty-five thousand people in New York who need treatment of the tonsil, apparently the X-ray is not going to be of much benefit in reducing this number. The actual time of using the ray is three to five minutes, but it has to be repeated from five to seven times. Therefore, the total time consumed is certainly more per individual patient than that when surgery is employed. There is no question that the X-ray will reduce the size of the lymphoid tissue. It has been used for years for that purpose in the case of severe lymph nodes in the neck, thymus gland cases and some cases of sarcoma, producing a reduction in the size of the tissue. The question, however, comes up, "What effect will simply reducing the size of the tissue have on the infective material?" The first statement made was that the tonsil was sterilized as the result of this procedure. The Rockefeller Institute cultured the tonsils before and after it, and found various organisms before and also afterwards, and all the tonsils were sterile afterwards. It just happens that three persons so treated, complaining of various so-called rheumatisms, have come under my care. One of these patients I had seen before being X-rayed, but I had not cultured the tonsil. I cultured it afterwards and found streptococci. The symptoms of none of these patients were in any way ameliorated as the result of the treatment, and they were very bad operative risks. One, a man sixty-five years of age, with more than two per cent of sugar and diacetic acid, did not have his symptoms a bit relieved. We have had two cases besides these three in which we advocated the use of the X-ray in the hope that it would do something for them in the way of reducing the size of the lymphoid tissue and reducing the severity of the symptoms. I am afraid that it will be found eventually that the X-ray or radium will unquestionably reduce the size of the tonsils; but whether it will put the tonsils in such a shape as to free them from infection, especially in the case of small sized tonsils, I have great doubt.

Dr. Lewis A. Coffin, New York City: The trouble seems to be altogether with those tonsils that do not free themselves of pus or crypt secretion and accumulation. The retained matter acting as an irritant or infecting agent causes local inflammatory or distant infectious conditions. The size of the tonsil per se has nothing to do with it. We all know that the large Irish potato-looking tonsil, filling out half of the pharynx, is the most innocent of tonsils except for its physical in-the-wayness.

The problem of the tonsil is solved if the crypts are thoroughly drained or rendered aseptic. If radium or the X-ray when safely used will do this (which I doubt) then hands up for radium or the X-ray.

Dr. Swain accomplished the desired ends by splitting up the crypts and the application of some of the various antiseptics. Probably every man present has accomplished the same end by the same means.

Interesting questions are why some tonsils develop and interfere with their own drainage, and again, can one do anything to prevent such development.

Dr. J. Payson Clark, Boston, Mass.: I should like to report briefly a case which I think worth recording, both on account of the age of the patient and on account of the happy result of tonsillectomy. She was sixty-nine years old and had had rheumatism in the chief joints with considerable pain. She had had tonsillitis three years in succession, followed by a stiffness in the finger joints. There were buried tonsils, full of cheesy material, especially in the crypts of the tonsils. In this case, the history and the appearance of the tonsil seemed to point pretty conclusively to this being the source of the trouble, yet in a patient of that age, I hesitated to advise tonsillectomy. I referred her to an orthopedist, who gave her a thorough examination, and said the arthritis was of combined origin. He thought the tonsillar ailment important, but advised simple measures first. She went under treatment for several months without improvement. Finally she said that she had decided to have the tonsils out. I removed the tonsils on the 17th of May, 1918. She had remarkably little trouble afterwards. She was able to eat by the next day. I was apprehensive that she might have a great deal of pain and discomfort. The right tonsil was very adherent. She went to the country on the 19th, and I got a letter on the 24th saying that she had had no more pain in the joints, but that they were still stiff. This chronic process had been going on for so many years that there were changes in the joints that could not be relieved by operation. Two years afterwards she said that she was free from pain and could walk with more ease, and that she was much pleased with the result of the operation. Slitting the tonsils, of course, is a procedure which has been successful in the hands of many of us. Suction in the crypts, I think a valuable treatment in suitable cases.

Dr. George L. Richards, Fall River, Mass.: I should like Dr. Delavan to tell us about the tendency to dryness of the mouth and throat. Even with ordinary tonsillectomies, there is a certain amount of dryness resulting in a certain percentage of cases. All forms of new treatment pass through a stage of enthusiasms, a stage of criticism, and a stage of hostility. Is that going to ensue with this type of work, roentgen and radium? There is no doubt that the X-ray and radium will destroy lymphatic tissue, but is it not possible that in this destruction we shall have ill results, not in a year, but in some later period?

Dr. Harmon Smith, New York City: I will omit answering Dr. Swain and Dr. Hastings, and confine myself what I have to say to the X-ray and radium. We all know that in the application of both X-ray and radium they benefit a malignant tumor by the production of endarteritis. The application does not destroy the tumor; it shuts off the blood supply, and shrinks down the mass. The first blood supply is very primitive. When we cut it off, the diseased tissue shrinks in due course of time; but nature establishes a new blood supply of more lasting character; and the tumor begins to grow again. When, in the application of raying, it does not destroy the lymphatic tissue but shuts off the blood supply to the lymphatic channels, the tissue shrinks; and when the blood supply begins to

reestablish itself, as it will, if the patient live long enough, you will have an increased growth of the mass.

Dr. John R. Winslow, Baltimore, Md.: The X-ray and radium will destroy tissue, lymphoid tissue included. Radium has been used for that purpose; what proof have we that it will not destroy more important structures in the neck? If it will destroy these tissues, why will it not destroy important endocrine structures—the parathyroids, for instance? In applying the X-ray to the nasopharynx, I think that there is a certain possibility of the production of a meningitis. In fact, this has occurred in the treatment of tumors in this region with radium. These are points that I should like to present to you. In the treatment of comparatively simple hypertrophy, such as that of tonsils and adenoids, I do not think that the time element is much reduced or that the safety is much greater, as compared with surgery.

Dr. Hastings, Los Angeles, Cal. (closing): We should study our cases thoroughly before deciding for or against operation. It would be interesting to study those cases in which we did not operate to see if secondary focal symptoms developed. It would also be interesting to study a group of cardiovascular cases in the same way I have attempted to study this group of rheumatic cases.

Dr. Goodale asked whether there had been anaphylactic reactions noticed in the uncured cases. My attention was not brought to such reactions. Such may have been the factor in the case reported where the patient starved himself for twenty-six days on account of rheumatism with marked improvement, symptoms recurring on beginning to eat.

Dr. Delavan, New York City (closing): The thesis just presented was prepared at the request of the president of the Association, who desired that the subject of the treatment of diseased tonsils by X-ray and radium be brought before the Association for explanation and discussion. My object has been to record the latest facts and theories pertaining to it, not yet venturing positive opinions of my own. In the present stage of the investigation, it would seem that our attitude should be one of receptivity. This seems to have been submerged in a wave of rather premature objection. By no means all of the propositions regarding the use of radium in this connection have been scientifically established. Much more must be learned and proved before the method can be accepted as effective and safe. One fact, however, seems to have been definitely demonstrated, namely, that radium exerts a powerful influence upon lymphoid tissue, even when applied in very small doses. It has also been proved that there are certain other things which it will not do. One of these is to reduce fibrous tissue. Another is to destroy the activity of septic germs. By so much at least its value in the treatment of the tonsils is negative. In certain other conditions referred to in the paper the success of its application seems fully to warrant more extended investigation. The worth of the method is being scientifically tested in the best hands. When the tests have been carried on for a sufficient length of time, we shall know more about the subject. At present the situation is tentative.

Dr. Swain, New Haven, Conn. (closing): I have worked a good

deal on what I have presented to you. It has been conscientiously done, so that I am able to assure you that the details have been carefully gone over, and I think that there are several safe methods to eliminate the tonsil, as the cause of trouble. You can do it in one of these ways, and not do a tonsillectomy. I agree with Dr. Hastings' experience in one of his cases in considering these focal infection cases, that we must remember that we have twenty-six feet of intestines of which the tonsil is only the beginning.

Ventriculocordectomy—A New Operation for the Cure of Goitrous Paralytic Laryngeal Stenosis.

By Chevalier Jackson, M. D.,
Philadelphia.

The literature of laryngeal stenosis is so burdened by the premature reports of cases that the author has waited for the lapse of time to prove the permanency of what he believes to be an ideal operation for the cure of that form of stenosis associated with bilateral recurrent paralysis when the stenosis is due solely to the paralysis. In these cases, tracheotomy has usually been already done for urgent dyspnea, and the patient comes to the laryngologist for decannulation.

Technic: No anesthetic, general or local, was used in children. In adults, cocaine was painted on with a swab and a sedative of morphine gr. $\frac{1}{4}$, was given hypodermatically an hour before operation. The larynx was exposed with the direct laryngoscope and through it the punch forceps were inserted. The ventricular band was elevated and the forceps applied. Thus the floor of the ventricle and part of the mucosa of its outer wall was removed at one clip. A clear cut is necessary. The tissues must not be hacked. In some cases the ventricular bands were in tight apposition, so that the forceps were insinuated between them before expanding the jaws. Great care should be taken to avoid getting too far outward between the thyroid and cricoid cartilages lest the cricoarytenoideus lateralis be injured. With the forceps used, this accident is easily avoided. Great care should also be taken not to excise any part of the arytenoid cartilage. The clipping off of the extreme tip of the vocal process of the arytenoid was necessary in some of the cases because of the shortness of the cord; but the excision of more than this is unnecessary and should be avoided. It may not be amiss here to state that, judging from experience in postgraduate teaching at the Bronchoscopic Clinic, few laryngologists seem to realize how far the vocal process of the arytenoid projects forward toward the anterior commissure. To perform the operation, however, requires education of the eye and the fingers in endoscopic technic. Of course, the excision of cord and ventricular floor can be done by laryngofissure, but here we have, though not a serious operation, yet one that will appear much more formidable to the patient. No after treatment is necessary. The surface of the wound is covered with an exudate under which healing by granulation progresses. In one case, a granuloma appeared at the site of the wound, and excision was done lest it later lessen the lumen of the airway. In two cases a

slight degree of perichondritis was present, after the excision of the second cord and ventricular floor; but it subsided spontaneously in about a month. In one case the lumen of the airway was not quite sufficient, and prolonged treatment with the McKee divulsor was necessary to increase it. Bouginage can be used for this purpose after ventriculocordectomy, though it or any other form of dilation is useless before removal of the obstructive cord and its supporting tissues. The duration of the operation done endoscopically on one side only, was never over one minute in any case, not counting the time required to paint on the cocaine solution. The healing has not required more than three weeks in any case and in some cases healing was completed in 10 days.

Conclusions: 1. In ventriculocordectomy I believe we have a simple endoscopic operation that can be done under local anesthesia and that will cure almost every case of laryngeal stenosis due solely to abductor paralysis if the case is not complicated by a faulty tracheotomy.

2. Ventriculocordectomy is indicated in cases of stenosis resulting from a hopelessly paralyzed larynx.

3. This or any other form of operative clearing of the airway is contraindicated in the first six months of abductor laryngeal paralysis. In most cases it is wise to wait a year.

4. The best means of affording relief of dyspnea and safety of the patient during this waiting period is by prompt low tracheotomy. High tracheotomy is the cause of more cases of cicatricial laryngeal stenosis than any other one thing. With a low tracheotomy, a pair of proper cannulae and a daily toilet of the fistula there is nothing lost by waiting.

5. Out of 18 cases ventriculocordectomized the 7 that were uncomplicated by cicatricial stenosis were afforded by this procedure alone satisfactory relief of dyspnea. One required divulsion in addition.

6. The chief functions of the larynx are phonetic, protective and expectorative. Considered in the light of the degree of preservation of these functions, ventriculocordectomy, I venture to think, not only surpasses any previously devised operation, but is simply ideal for those cases in which neural and muscular atrophy has rendered resumption of normal cordal motility hopeless by either spontaneous recovery or neuroplastic surgery.

DISCUSSION.

Dr. D. Bryson Delavan, New York City: We know that methods similar to this have been employed, not only in the surgery of the human being, but in veterinary surgery; and any betterment in the process and what might be called standardization of the treatment is welcome.

Dr. Robert Clyde Lynch, New Orleans, La.: I have seen but two or three cases of this type of paralysis, but it struck me, during his description of the reason for the regeneration of the vocal cord, that in these cases of infralaryngeal carcinoma which I have operated on by suspension, and in which I have evidently removed a good portion of the vocal process of arytenoid cartilage and muscle, there has been no effort on the part of nature to reform

any portion of the cord whatever. I was at a loss to know why this has occurred; since in cases of thyrotomy, the cords do reform, or something reforms which takes the place of the vocal cords. That has been noticed in the cases that I have operated on by intralaryngeal resection. None of the cases have shown any disposition to renew the cord. The space remained wide open, and as if this were rubbed out entirely. Possibly this may add something to the theory of regeneration of the cord.

Dr. Cornelius G. Coakley, New York City: We have seen, in this connection, in our service at the Bellevue Hospital, two or three cases a year. The only treatment that we have been using has been that of tracheotomy. Most of our cases are those which come as the result of central lesions or bulbar paralyses. I should like to ask Dr. Jackson, first, whether he considers that it is necessary, in long standing, slowly developing cases of bulbar paralysis, to do the tracheotomy; and second, how much hemorrhage he gets during the operation on small children?

Dr. Joseph B. Greene, Ashville, N. C.: I have several patients under observation at the present time who should have some treatment, and I shall refer them to Dr. Jackson.

Dr. Henry L. Swain, New Haven, Conn.: I should like to know what proportion of cases have to have the double ventriculocordectomy, and what vocal results Dr. Jackson gets—what proportion of patients can speak audibly enough to be understood in a noisy place.

Dr. Emil Mayer, New York City: I should like to ask Dr. Jackson to let us know what local anesthetic he uses; what is the manner of application; and the strength of that particular local anesthetic.

Dr. Swain, New Haven, Conn.: Is that forceps big enough for a grown man? Will it give space enough?

Dr. Chevalier Jackson, Philadelphia, Pa. (closing): In these cases of tabes, disseminated sclerosis and other conditions that are eventually fatal, although not for a long period of years, it is a question for the patient to decide as to whether or not he will get along with tracheotomy palliation, or whether he wants this operation done. In many of these patients the paralysis becomes total. That is, the cord assumes a cadaveric position in the first cord before the other becomes paralyzed. In that case, where one cord becomes cadaveric before the other one, the patient has a chink large enough to get along with. When the second cord becomes paralyzed, he does not asphyxiate because the other cord is in the cadaveric position.

In regard to the matter of the voice, the patients must be told that the voice will be reduced to a whisper for quite a number of months. Then it will be a stage whisper, and later they will phonate; and in a year or so, they will have a voice that can be heard across the room. It is a deep, rough voice, without modulation; but abundantly loud for all ordinary purposes. It is particularly to the goltrous cases that the operation is adapted. Their expectation of life is longer than in other cases. In tabes and disseminated sclerosis, it is not so long; although many survive for years.

With regard to Dr. Swain's question about the necessity of doing a double operation, after making a section on one side, usually about a month elapses before I do the second cord. If the patient should feel that he has plenty of air to get along with, the second cord may not need operation; but I should not feel justified in abandoning the tracheotomy canula in that case.

Regarding the name of the operation, the floor of the ventricle is excised; and that is why I use the term ventroculocordectomy, faulty though it may seem.

With regard to Dr. Mayer's question about the anesthetic, twenty percent cocaine was sufficient in most cases. Most of the patients were adults; but one was a child, in whom no anesthetic, local or general, was needed.

Dr. Coakley. My questions were not answered. Is preliminary tracheotomy necessary? Has there been much hemorrhage?

Dr. Jackson: With regard to preliminary tracheotomy, in the cases of bilateral paralysis in which one cord had become cadaveric, the patients will get along without tracheotomy; but I always feel that it is better to tracheotomize both, rather than to wait a year to see if movement will be recovered. If no motility appears within a year, abduction will never come back. Ventrilocordectomy is indicated. Regarding the hemorrhage, it is extremely insignificant, or very slight in amount. Probably the pinching of the forceps pinches off the blood vessels and prevents the hemorrhage.

Papilloma of the Larynx in Children, With the Report of an Unusual Case.

By O. A. M. McKimmie, M. D.,
Washington, D. C.

In carrying out the review of the literature on this subject, I have been impressed with the following facts: That our knowledge of the causation of papilloma has not increased; that nearly all writers during this period state their conviction that removal by use of the direct laryngoscope is the preferable method if removal, seems best.

The youngest children operated by the direct method were one 17 months old and one of 18 months. No operative method seems to have been entirely satisfactory—operative measures having to be repeated in most cases. Numerous cases of spontaneous cure, that is, disappearance without actual removal of the papillomata themselves, have been reported.

The following case is illustrative with a history of increasing hoarseness and difficult breathing for the preceding six months. She was evidently suffering marked laryngeal obstruction. Laryngeal view was very difficult to obtain, but finally a granular mass which filled the entrance except for a very small chink posteriorly presented. The child was ordered taken to the hospital and the consent of the parents gotten to do a tracheotomy whenever I deemed it necessary. The next day, as her breathing was getting steadily worse, I did a low tracheotomy, a few whiffs of ether being used. Operation was without incident, although the neck extremely short, the patient being very small for her age. At the

end of one week I opened the larynx and thoroughly removed the masses of papilloma which practically filled the box of the larynx below the cords and extended also above them.

The patient was discharged at the end of the twenty-fifth day without the tube and with the laryngotomy wound healed. During the following five months she was perfectly well, with perfect comfort in breathing and with perfectly clear voice. During December, 1915, 6 months later, she suffered an attack of grippe, which seems to have been the starting point of a recurrence of her papillomata, which necessitated her readmission to the hospital on January 8, 1916, at 11:45 P. M. Immediate tracheotomy was done, followed one week later by laryngotomy. The following 152 days were spent in the hospital, the tube being worn continuously so that rest of the larynx for respiratory purposes would give the greatest chance of allowing the process to run its course without reinfection, if we may use such a term. After this the mother, who had become quite an expert in the care of the tube, looked after the patient at home and brought her to see me about once a week. I was confirmed in my idea of letting the patient wear the tube for an indefinite period by finding some three months after discharge from the hospital that there were small papillomatous masses on both posterior pillars of the pharynx, which later disappeared spontaneously. Phonation with the tube stopped, after removal of the inner tube, was clear but weak, but the child was afraid to have the inner tube out for more than a couple of minutes at a time. She wore the tube continuously for two years and one-half and I was about ready to dispense with it and close the tracheal opening, but did not have the opportunity, as she died of influenzapneumonia during an epidemic. The microscopist reported the masses removed as papilloma.

Notwithstanding the increasing facility and certainty with which laryngologists use the direct laryngoscope for the removal of growths in the larynx, and the numerous reports of its use in very young children, I am still quite firmly convinced that its use, without preliminary tracheotomy in children under four years of age, is not justified and that in very small children tracheotomy, followed by opening the larynx, is preferable, because this operation, when carefully done, permits absolutely perfect access to every portion of the organ and more perfect removal without undue traumatism of every particle of growth. As a matter of fact, I do not believe it is always possible to get a larynx perfectly cleared out by the direct method, even in adults, and with suspension. The various drugs applied locally by sprays, inhalation or otherwise in adult cases, with the idea of dehydration, limiting the blood supply of the growths or causing change in their structure, have in the main been unsuccessful, and to my mind are not applicable in small children. Radium and X-ray exposures have been used and a few good results therefrom have been reported.

Cases are reported of cure by removal followed by fulguration repeated at intervals.

I would make two classes of laryngeal papillomata in children. First, those in which no marked obstruction to breathing exists and in which the patients are in good general condition; and sec-

ond, those in which there is progressive difficult respiration. In the first class, we may temporize in the hope of spontaneous cure, which has been reported by a number of observers, supplementing our waiting by such measures directed to the general health as may seem advisable. In the second class we must consider:

1. Removal of growths by the direct method without preliminary tracheotomy.
2. Simple tracheotomy, relying on laryngeal rests to bring about a cure.
3. Tracheotomy followed by direct laryngoscopic removal of the growths; and
4. Preliminary tracheotomy, followed later by laryngotomy.

If our knowledge of the causation of papilloma in the larynx were greater we would be in position to supplement our operative procedures by means to prevent the recurrence; but unfortunately every theory of causation seems to have been controverted by reported cases in which the assumed causative factors were lacking.

DISCUSSION.

Dr. J. Payson Clark, Boston, Mass.: I still adhere to my position, which I have stated several times, in regard to the treatment of these cases; that no treatment should be undertaken that in any way will cause permanent injury to the larynx or leave a scar. Papillomata, as you all know, resemble histologically a dermal wart, the ordinary wart; and there is some activity of cellular growth at a certain period in the life of a child, which makes these growths very persistent. During that period removal by any method is not going to be successful. I believe in a preliminary tracheotomy in all cases in young children, owing to the size of the larynx, and owing to the danger of rapid growth and of obstruction of the larynx following. After doing a tracheotomy, I believe in giving the larynx a period of rest. Like an ordinary dermal wart, a laryngeal papilloma will often disappear.

Dr. George L. Richards, Fall River, Mass.: I had a patient, a girl of twelve, who came to see me because a physician had advised laryngotomy. She had difficulty in breathing and was absolutely hoarse. On both cords were masses of papilloma. After taking the time to train the child so that she would submit to having an applicator carried into the larynx, removed the papilloma. Then for a period of only a month the next year, I made applications of alcohol directly to the cords. I saw that child over a period of five years, from once to twice a year. She has now disappeared from view. When I last saw her, she was eighteen years old, and there never was any recurrence. She was saved any operation. She did not have a tracheotomy.

Dr. D. Crosby Greene, Jr., Boston, Mass.: I have had an experience with a patient with papilloma, upon whom I operated once or twice by the direct method, which I think has a bearing on the subject of this paper. After I had operated upon the child two or three times, his mother took him to another surgeon who operated upon him by thyrotomy and thoroughly cleaned out the larynx. Subsequently, within a year, I saw this patient with his larynx full of papilloma. Such an experience, it seems to me, is sufficient

reason for not resorting to such a radical procedure as laryngotomy in these cases. If the growth tends to recur, even after radical operation, it seems to me that we are not justified in using the more radical procedure.

Dr. Henry L. Swain, New Haven, Conn.: I had a case that recurred, in an adult, and when I was just learning to do direct laryngoscopy. I took off the next two or three with the direct method, and had a return of four or five small papillomas in various parts of the larynx. The young woman became pregnant, and could not come to the office; and I suggested that a spray of alcohol in the larynx might be carried out by her family physician. It was done, and four or five papillomas in various parts of the larynx receded under this treatment, and had disappeared entirely by the time she was able to come to me again, with only the original growth remaining on the vocal cord. That I removed with direct laryngoscopy and followed this up with alcohol for some time with no recurrence.

Dr. Robert Clyde Lynch, New Orleans, La.: Just as much as I was in favor of the removal of papilloma by dissection some years ago, thinking that I had a cure for this condition, I am now opposed to it. The first fourteen cases that I had and operated on were relieved at the one sitting, and I have never been able to duplicate that result since. My experience covers ninety cases at the present time. I have reason to speak that way. I believe now that any cutting operation is likely to be followed by recurrence of the papilloma. That is almost certain in my experience; not only that; it seems to be followed by a type of papilloma that indurates below the level at which the tumor originally grew. Therefore, the deeper the tissue, the harder it is to combat it surgically ever afterwards. It is for that reason that thyrotomy or any type of operation except that described by Dr. Jackson this morning is not indicated. The best results that I had have been by drying the surface with alcohol and ether, and using either fulguration or the actual cautery. For a time, I thought that fulguration was the better of these two means; but now I am leaning towards the use of the actual cautery, applied practically in the same way as in laryngeal tuberculosis. The performance of a tracheotomy early in those cases, in which it is not absolutely essential for breathing, is to be looked on with fear and trembling; because the papilloma masses will automatically grasp themselves around the raw surfaces and at the distal end of the tube, and you will plant papilloma that did not exist into the trachea. You not only have laryngeal papilloma, but also tracheal papilloma to deal with, which increases the difficulty of the case. In practically every case of papilloma that I have seen there seemed to be the psychological moment for its disappearance. In other words, I have operated on cases any number of times. The greatest number of operations on any one patient was forty-two. We operated on one little patient forty-two times, which is an evidence of the inefficiency of type of surgery that we can use—and in some of these patients we had removed the papillomatous mass completely, apparently at the time, and expected the usual recurrence within a month or six weeks, and for some reason or other, there would be a cessation of the return of the growth. There apparently was no difference in

the look of the tissue, from a pathologic or physiologic standpoint, at the time of operation; yet in some of the cases, there would be no recurrence; and I have never been able to tell, at the time of the sitting, whether this would be the last time to operate on the patient or not. That is one of the peculiar phases of the situation.

Dr. D. Bryson Delavan, New York City: In the small, well-defined, slowly growing, warty papillomata of the larynx, the use of alcohol, as suggested to me about twenty years ago by the late Dr. Charles H. Knight, will in many cases effect a cure. In certain other cases it will retard the progress of the growth, diminish its size, and render its thorough removal more easy. But there are many papillomata of the more active type upon which this treatment has no effect. Also in the case of children, it has generally been in my hands entirely impracticable. To be effective, the alcohol must be as pure as possible, at least 95%, and the applications, in the form of spray, must be made at least once daily, the spray being driven well into the interior of the larynx. This the patient can be taught to do for himself, in order to secure the necessary frequency and regularity of treatment. In some cases a solution of sulphate of zinc, two or three grains to the ounce, makes an excellent substitute for the less agreeable spray of alcohol. In suitable cases the value of this method of treatment has been amply proved.

Dr. Oscar A. M. McKimmie, Washington, D. C. (closing): Since I recorded this case, I have not seen a case of papilloma in either a child or an adult. In so small a child, I should probably do again what I did in this case, because I believe that even the method suggested by Dr. Jackson this morning, of removing by forceps, offers as much chance of spreading the papilloma as laryngotomy. The latter, in the hands of the average laryngologist, I consider to be a safer operation. If I had a child over four years old, I should attempt removal by the indirect method, because I was brought up on that, and use it more skillfully than the direct method. If I had a smaller child, I should probably do a preliminary tracheotomy, and remove the growth by subsequent laryngotomy.

Presentation of Patients, Instruments and Reports.

Dr. Delavan, New York City: Presented a patient showing the splendid results following external applications of radium. Dr. Delavan then asked the patient to show the character of the voice as to the length of treatments.

Patient: I had two hours for the first time, and four and a half hours on each side. They were crossfired and the next time I had one hour and fifty minutes on each side. The third time I had two hours. My voice, as you hear, is coming back. I really think that it is getting better each day.

DISCUSSION.

(Dr. Delavan's patient.)

Dr. Chevalier Jackson, Philadelphia, Pa.: I feel so enthusiastic over the results in this case, that I should like to say a word. After not so many weeks of perfectly painless treatment, she came

in with all the enormous masses that had occupied the place of the ventricular bands simply melted away. It approached ideal medicine in a way which we practically never see. It looked as if that was one of those sad cases of inoperable malignancy. It is one of the most brilliant cures that I have ever seen, and I was so enthusiastic that I made these drawings.

Dr. Chevalier Jackson then presented a little girl who had masses of papillomatous growths removed with the crushing forceps. Her speech was clear and there had been no recurrence.

General Measures in the Treatment of Laryngeal Tuberculosis.

By Lawrason Brown, M. D.,
Saranac Lake, N. Y.

While tuberculous laryngitis is rare in children and more often found at autopsy, it occurs in about 25% or more of adults with pulmonary tuberculosis, slightly more in men than in women, and next to tuberculosis, enteritis and colitis is the most frequent complication of pulmonary tuberculosis, due most likely to direct infection of the part by the sputum. Laryngeal tuberculosis is rarely, if ever, a primary disease, a statement with which I am sure many of you will agree.

One vital essential in the treatment of tuberculosis has become, if I may so express it, part of us. I refer to rest. We put the patient on silence and give the larynx absolute rest, except for such movement as occurs in breathing, swallowing and coughing. We forbid whispering, whistling and every other use of the larynx. The results from this absolute rest are just as striking as they are in the case of tuberculosis of the knee, of the hip, of the spine, or indeed of any other organ that can be given nearly 100% functional rest. Absolute rest of the larynx can probably be most nearly attained by performing tracheotomy and the use of the tube. Chevalier Jackson has reported three cases of laryngeal tuberculosis, supposed to be primary, who wore tracheotomy tubes and got better. In the vast majority of cases such radical measures are not necessary. How long such absolute rest should continue must depend upon how the lesion progresses. Lip whispering, then ordinary whispering, next an occasional sentence in speaking tones, is the method of progression, but singing, shouting, public speaking should be avoided for some months after recovery. Personally, I go further in the rest treatment and do not hesitate to put my patients to bed for six weeks, with wide open windows, or better still, upon a porch during the day and in a well ventilated room at night. I do this for the following reasons: Pulmonary tuberculosis is usually present and partial rest of the lung as much as is possible, is thus effected. Cough, which may injure the larynx when excessive, is better controlled by rest in bed than by any other means, for reduction of the number of respirations means lessened irritation of the irritable lungs, consequently lessened secretion, and in turn lessened cough, and so less sputum flowing over the larynx.

Recovery from laryngeal tuberculosis depends in most instances largely upon the condition of the pulmonary tuberculosis. With advancing pulmonary disease, fever and poor nutrition, it is diffi-

cult to promote healing in a tuberculous larynx, but I have seen it done with the aid of the electrocautery. Few laryngologists still seemed to hold to the idea that local treatment was the important thing. In regard to local treatment, I feel that the laryngeal dropper, devised by Dr. Yankauer of New York, is not yet widely enough known and used, for I can now recall only one or two patients who have come to me with laryngeal tuberculosis who had ever previously employed it.

To produce rest and to facilitate swallowing, freedom from or lessening of pain is necessary. I have tried injection of alcohol into the superior laryngeal nerve with some success, but the respites have never been long. The insufflation of anesthesin or orthoform has been helpful. In these cases the laryngeal dropper has proved a godsend. Before the application of drugs I have the patient thoroughly rinse or wash out his larynx with physiologic salt solution. Menthol (1%) in oil is an excellent application to begin the method upon, for if the patient swallows it, no harm is done. Then stronger solutions of menthol, emulsions of anesthesin, or what I have found is best of all, Freudenthal's emulsion of orthoform and menthol, can be applied as necessary. I have by these methods been able to avoid largely cocaine, with its disagreeable after results. In a few cases I have not hesitated to use morphin hypodermically when necessary. More recently I have been interested in the use of a thin solution of gelatin suggested by Mr. Petroff from his studies in physical chemistry. He afterwards placed in our hands a strongly immune serum (sheep or goat). Spraying the larynx with these substances apparently afforded a few patients marked relief, but in others was of little avail.

In conclusion, I would like to say that about 100,000 persons die from pulmonary tuberculosis in the United States every year. At least 40 to 50 per cent of these have some laryngeal tuberculosis. If patients live on the average about three years, there must be about 300,000 or more patients in the United States, of whom 25 to 50 per cent have laryngeal tuberculosis, in all then, about 100,000 have laryngeal tuberculosis. Many of these are people with slight or no means. Treatment of their throat condition must in large part devolve upon the medical men doing tuberculosis work. They feel their shortcomings and are eager to turn to you for help. But when they see a patient with high fever dragged to a laryngologic dispensary, which they know is wrong, they realize that they or some one else has erred.

Climate in the Treatment of Laryngeal Tuberculosis.

By Carroll E. Edson, M. D.,

Denver, Colo.

(By Invitation.)

Tuberculosis of the larynx is practically always secondary to an active pulmonary tuberculosis.

The extent and character of the primary lesions usually determine our choice of climate for the patient.

To discuss satisfactorily how the supervision of the laryngeal infection may modify this selection, we must first have a clear

understanding of the part climate plays in the cure of tuberculosis of the lungs.

In my paper, as it will be printed, I have dealt at length with this portion of the subject.

How does climate especially help the patient with laryngeal tuberculosis, and what choice of meteorologic components is desirable in his case?

Tuberculosis of the larynx responds only in a general way and to a slight degree to the increased vitality induced by outdoor life and to general nutrition. The local laryngeal lesion is less directly affected by these factors than is pulmonary tubercle. Its arrest is more dependent on the third member of the physiologic triad, rest.

Under the establishment and maintenance of complete rest the prognosis of laryngeal tuberculosis is much better than commonly believed. This complete rest, incomparably the most important part of the treatment we can bring to bear, is curiously difficult to secure.

The first, the most effective means to this end, the hardest to obtain, is silence; the absolute avoidance of all phonation.

Next in value to silence in securing the fullest rest to the larynx is the abolition, reduction or control of cough from whatever source it arises.

The cough of infraglottic origin rising from the pulmonary disease will lessen with the improvement in that lesion. Climate, as I showed, is a valuable aid in securing that arrest and often gives surprisingly prompt results in diminishing the cough.

The local laryngeal irritation, most soothed by rest, may occasionally need local sedative applications. It is, however, to a considerable degree affected by atmospheric conditions presently to be mentioned, the control of which may greatly assuage the patient's discomfort.

The supralaryngeal cough caused by nasal and especially pharyngeal trouble is a factor of great importance in its wear upon the patient. From my observations it is not sufficiently appreciated or given enough detailed care. Even in purely pulmonary tuberculosis no small fraction of the most annoying cough is alleviated by proper and painstaking care of the catarrhal or obstructive congestion of the upper respiratory area.

In laryngeal tuberculosis the cough from these sources is especially harmful, for it remains always a nonproductive, unnecessary cough of purely mechanical violence.

Now it is in helping control and lessening the cough arising from the nose, pharynx and glottis that certain climatic factors play a definite and direct part. So important and so readily demonstrated is this role that the presence of a tubercular laryngeal lesion calls for especial consideration of them in the choice of climate. The later development of a laryngeal tuberculosis may for the first time make a change of climate advisable.

A patient with laryngeal tuberculosis does not endure well extremes of heat or cold. Such patients are prone to loss of appetite and poor nutritional balance, even before any pain or swallowing has occurred. This early loss of weight, and the frequently

accompanying anemia is out of proportion to the added amount of tubercular disease. I believe it is the result of anxiety, discouragement and fear born of the knowledge and constant evidence of the new complication. Consequently any added cause for poor appetite and assimilation, such as heat or humid weather, is to be avoided.

Equally do such patients suffer from great cold, especially at night, and the irritation from breathing very cold air may excite so much cough as to prevent sleeping out. Thus one of the most valuable opportunities for combining fresh air and rest will be lost. Even though the daytime cold is modified by bright sunshine, very cold nights, or too wide a diurnal range in temperature, are to be avoided. For these reasons it may be advisable for a patient who can afford it to make a winter sojourn in a more southern, warmer station and change to a cooler, more bracing region in the summer months.

Abrupt or marked change in the temperature of the respired air readily induces cough as we well know. Climates characterized by such sudden or frequent changes are to be avoided.

Damp air, especially if at all cold or in motion, is an immediate excitant of cough to an inflamed larynx or sensitive rhinopharynx. Therefore, the patient will benefit most if sent to a mild, equable climate with a dry air, low relative humidity and long periods without wet weather.

Strong winds and dusty air are sedulously to be avoided. Frequently in the same region of generally similar climatic conditions one locality will have a topography giving shelter from the prevailing wind, it will be thus entirely suitable, while a station near at hand, not so protected is undesirable. Such local details are important to consider even after the general problem has been settled. Indeed, the whole success in the cure of laryngeal tuberculosis is a matter of appreciation of and attention to detail.

In this connection, may I add a word, even if it seem a criticism? Too often we see patients sent long distance from home at a sacrificing cost to gain the advantage of a better climate for living out of doors who, because of a laryngeal lesion, take frequent or even daily trips to the physician's office. There they sit in a crowded, often poorly ventilated room, waiting their turn for local applications. This travel and waiting is undertaken frequently when the exertion involved or the presence of fever should forbid such conduct. Any febrile patient with laryngeal lesions needing regular local treatment should be treated at his residence. If the laryngologist cannot give the time for such visits, the patient will be best placed in a sanatorium, where the means for local care are at hand and where he does not have to pass his waiting time indoors rereading a last year's copy of *Outdoor Life*.

These are briefly the principles underlying the use of climate in the cure of laryngeal tuberculosis.

There is no specific climate for tuberculosis.

The disease may heal in any climate.

Some climates, however, offer the patient an incomparably better opportunity to make use of the three requisites for cure: an outdoor life, increased nutrition, physiologic rest.

Laryngeal tuberculosis does not require a climate essentially different from that for pulmonary disease.

It does benefit, however, from a little more care in consideration of a few details. These are, equableness, without extremes of heat or cold, especially the latter; freedom from frequent, sudden changes in temperature; damp air, particularly in winter, high winds and dust.

A careful consideration of the balance between the patient's needs, his means and the reasonable advantage to be gained from a change in surroundings is necessary to avoid disappointment or disaster. To make a correct selection the physician must understand the climatic characteristics of both the home and the contemplated resort. He must have an accurate knowledge of and interest in meteorologic statistics and be able to interpret them properly in terms of physiologic effect upon the patient.

Further advance in the best utilization of climate will come with a greater appreciation of the fact that the physical modalities of temperature, humidity, sunlight, wind and barometric pressure, are real and definite in their action. The more complete our study and knowledge of this physiologic response, which they demand from a patient, the better use we shall be able to make of these climatic components in the environment we select for the invalids who seek our counsel or depend upon our care.

The Treatment of Tuberculous Laryngitis by Suspension Laryngoscopy.

By L. W. Dean, M. D.,
Iowa City.

Using proper precautions, endolaryngeal operations may be performed upon the tuberculous larynx by suspension without detriment to a coexisting quiescent pulmonary condition.

It is quite impossible for me to do as accurate work by direct laryngoscopy as by suspension. I have done many more endolaryngeal operations by the direct method than by suspension. I cannot place my cautery or knife as accurately by the former as by the latter method, neither can I protect the larynx so well from the cautery point.

Unless there is some contraindication to its use, suspension laryngoscopy is to me the procedure of choice for endolaryngeal operations on the tuberculous larynx. The well illuminated larynx is thoroughly exposed. Both hands of the operator are free. He may have in one hand a spatula to expose better or to protect a certain area in the larynx, and in the other his galvanocautery point, punch or curette. He is at liberty to turn to his instrument table and select, if necessary, a different instrument without interfering with his work. He may take in his left hand a laryngeal speculum and expose the upper end of trachea, the anterior commissure or the interarytenoid space, leaving his right hand free for operative work on the part exposed. There is no hurry. The patient who is suspended the first time may feel that he is suffocating. The tuberculous case is particularly favorable for suspension. The emaciated neck makes the procedure a very easy one.

The work is done under local anesthesia. There is no excuse for loosening teeth. I frequently attach the tooth clips to a dental bridge, using a lead protector. There should not be the slightest danger of jaw fracture. The patient should be rapidly suspended, using every precaution for the patient's comfort. To get a good view it is not necessary to separate the jaws widely. Separating the jaws too widely may add to the patient's discomfort. It is not always necessary or advisable to bring the anterior commissure into view. It is never necessary to raise the patient's head from the table.

The anesthesia: Morphin, $\frac{1}{4}$ gr.; atrophin, 1/120 gr., is given twenty minutes preceding the operation. Ten per cent cocaine is applied to the epiglottis and larynx, using a cotton swab. The swab is held in contact with the epiglottis and cords until all tendency to sagging disappears.

Suspension prevents hemorrhage and edema by permitting of exact incision and cauterization when operating in the larynx and so thoroughly expose bleeding points that they may be properly handled.

For amputating the epiglottis suspension laryngoscopy is the procedure of choice. Under local anesthesia, using the short Lynch tongue spatula, the epiglottis is distinctly exposed. It is grasped with a tenaculum forcep and using a Lynch knife, cleanly severed at its base. I have not noted any hemorrhage of importance following this procedure. It requires but a short time.

The decision as to whether the operation is to be performed by direct laryngoscopy or suspension is made by the pulmonary expert. He approves of suspension for those cases who can have the endolaryngeal work done in this way without much risk of a reaction. The suspension in our hands gives the best results, and if it can be used without detriment to the patient, it is the method of choice. It is particularly desirable to suspend those cases needing cutting and curetting operations.

The frequency of suspension depends upon the needs of the larynx. Occasionally we have a case when galvanocautery is used under suspension every two weeks. These cases are usually ones that are discharged from the sanitarium whose larynges are scarred, the result of previous operations and the healing process, and who have returned for cauterization of suspicious small areas in the larynx.

The first essential thing in treating laryngeal tuberculosis by suspension laryngoscopy is to have the patient under the supervision of a pulmonary expert who has authority to say this patient shall or shall not be suspended.

Our tuberculous laryngitis cases are divided into four classes for treatment: First, those who remain in bed and receive only the simple medication; second, those who may sit up and have applied to the larynx mild astringents and antiseptics; third, those who receive endolaryngeal surgical procedures by direct laryngoscopy; and, lastly, those who are operated under suspension. The pulmonary expert, having before him the laryngologist's findings, decides in which class the case belongs.

While suspension laryngoscopy seems to me to be the ideal condition for the performance of endolaryngeal operations in cases with quiescent pulmonary conditions, it is particularly adapted to the treatment of superficial tuberculous ulcerations of the trachea. If these ulcerations are high up, using the laryngeal spatula these cases may be readily cauterized. If situated low down in the trachea a tracheoscope may be passed under suspension and proper treatment instituted.

DISCUSSION.

Dr. Joseph B. Greene, Asheville, N. C.: Dr. Edison has told us what we have thought for a long time, that climate has no direct effect on the larynx itself, but only affected it directly through the general health of the patient. However, he has presented in a scientific way the influence of climate on the general condition of the patient.

To Dr. Lawrason Brown we are indebted for emphasizing to us the importance of rest to the voice in the treatment of laryngeal tuberculosis. It seems to me, however, that the general man who treats pulmonary tuberculosis is apt to pay too little attention to the laryngeal condition. The treatment of the larynx is different from that of the lung condition in that we are unable to use local measures in one case, while the larynx is easily accessible for local applications. It seems to me, further, that the treatment of laryngeal tuberculosis depends largely on the stage of the disease, and likewise upon the site of the lesion. It is obvious that silence which has been so well emphasized could have no effect on lesions of the epiglottis and could influence very slightly, if at all, chronic infiltrations in other situations of the larynx. In ulcerations of the epiglottis there is no treatment to my mind comparable to that of epiglottidectomy. In many cases of ulceration and infiltration I am in the habit of using applications of formalin with a great deal of benefit to the patient. There are certain cases, however, which require the use of electric cautery. For this treatment I am in the habit of using the indirect method, though Dr. Dean has told us of the advantages of suspension in these cases. In conclusion, I wish to emphasize the importance of alcohol injections into the superior laryngeal nerve for pain in laryngeal tuberculosis. The method of making this injection was presented so clearly by Dr. Fetterolf in a complete paper published in the *Annals of Otology, Rhinology and Laryngology*, March, 1912, that little difficulty is experienced in making a successful injection.

Dr. George B. Wood, Philadelphia, Pa.: The only method I have found that yields positive results in the treatment of tuberculosis is the application of the actual cautery. As far as the cure of the tuberculous process is concerned, I do not believe that lactic acid or any other drug has any influence in checking the progress of the disease except in so far as they cure and prevent secondary infections. The application of drugs, however, for the purpose of combating secondary infection and of protecting the larynx against further inoculation from the pulmonary sputum should be recognized as an important part of the treatment. I believe that the cautery should supplant all bloody operative procedures. There

is a distinct danger in the use of the punch or other compressing instruments of forcing the tubercle bacilli from the local lesion into the neighboring lymphatics, and also the cut surface leaves an open channel for further infection from the pulmonary secretions. I have no hesitancy in asserting that the large majority of early cases of laryngeal tuberculosis can be cured by the use of the actual cautery, and I have frequently seen the laryngeal lesion healing while the lungs were rapidly breaking down. Of course, in extensive lesions of the larynx, especially where the disease is extrinsic, and in pharyngeal lesions, the prognosis is exceedingly bad, no matter what form of treatment is adopted; although I have seen large pharyngeal ulcers healed promptly after cauterization. The value of the cautery is not that it destroys the tuberculous lesion, but lies in the fact that it revitalizes an area which, because of the tubercle, has been deprived of its blood vessels. In a series of experiments on guinea pigs, I succeeded in producing cutaneous lesions of the abdomen by the use of an attenuated tubercle bacillus. The tubercles that were cauterized always healed promptly while the control was progressing. Histologic examination of the cauterized tubercle showed that within three days the eschar was surrounded by a network of capillaries and was thrown off by granulating tissue in about seven days, leaving a superficial ulcer which promptly healed. The rest of the tubercle, formerly free from any evidence of blood vessels, was now permeated with capillaries and the epithelioid cells were rapidly replaced by fibroblasts and in a comparatively short space of time no evidence of active tuberculosis could be detected in the region of the original lesion. From a clinical standpoint, a very important point in favor of the use of the cautery is its comparative ease of application by the indirect method. In a large majority of patients, laryngeal lesions can be cauterized during the ordinary office routine with no more discomfort to the patient than an ordinary laryngeal application.

Dr. Robert Clyde Lynch, New Orleans, La.: I should like to mention two cases that have yielded very nicely to the sun's rays, which were applied by the patients themselves, at a time during their convalescence when the pulmonary lesion was entirely quiet. Suspension certainly does facilitate the ease and accuracy of the application of the cautery. I think that the greatest number of cases of laryngeal tuberculosis that I have seen at any time were those of Dr. Dean; and in many of those cases it was almost impossible to tell that the patients had been the victims of previous tubercular ulceration. Healing, so far as my imagination went, was beyond expectation. These cases of laryngeal tuberculosis, as far as my experience in my own patients went, were remarkable. I do not think that Dr. Dean said enough about his routine treatment, as carried on in the institution that he has charge of. I saw fifty-five to sixty cases one afternoon, in all phases of ulceration of the larynx, and in all phases of activity and quiescence of the process in the lung; and I am sure that I saw fifteen that were as well as any larynx that I have looked into for some time. They were tubercular patients in whom the process had been active and the history records were there to show what had gone on.

Dr. Cornelius G. Coakley, New York City: I have divided the subject of laryngeal tuberculosis into two parts: First, the non-ulcerative form, and second, the ulcerative form. In the nonulcerative form, most of these patients were able to go away from their homes; and it is perfectly surprising the results that are obtained by the absolute silence that these patients are recommended to employ. They come back with larynges that are as clean as any normal larynx. Then they show on their vocal cords enormous thickening and infiltration, which in former years I was in the habit of letting go on to the ulcerative stage, involving the epiglottis. I now have them treated in this manner; and you would not believe the degree of absorption that results. In a comparatively short time, all these cases have improved so far as their pulmonary condition is concerned. They have come back with perfect respiration and voice. In the ulcerative type, you do not always get such good results, especially where the epiglottis and adenoid region are involved. All these patients have great difficulty in swallowing, and the greatest difficulty is in keeping up the nutrition of the patients. The thing which in my hands has given the patients the greatest relief from the difficulty and pain of swallowing, has been the application of orthoform, one grain; iodoform, one grain, and compound stearate of zinc, one grain. The patients can be readily taught to apply these themselves by taking the powder blower and making a blast and a pressure of the bulb with inspiration, at the same time. This will carry that mixture over all portions of the lower part of the pharynx, larynx and even down to the trachea. The first two or three applications are disagreeable to the patient from the cough produced; but in a short time the application can be made without producing any cough. I believe that the powder of compound stearate of zinc holds the orthoform and iodoform against these lesions, protects the ulcer from the streptococci that are present and limits their spread.

We have not had a chance to do very much treatment with suspension, because most of the patients that do come to us are able to be put on sanatorium treatment, where, I think, they do much better than at home. I object to home treatment, because it is difficult to carry out. The family will come in and interfere with the carrying out of the treatment. They cannot do this at the sanatorium. 1

Dr. James E. Logan, Kansas City, Mo.: I have often taken these cases and put them into the old-fashioned prairie schooner and sent them across the plain, and in going across they have found the location in which they have improved most. Most of them have been improved. To my mind, the ideal treatment would be, if you could carry it out, to have a patient with tuberculous laryngeal ulceration go to the spot that benefits him, and there receive the suspension laryngoscopy after the lungs and other conditions have been improved sufficiently to accept that treatment. That, to my mind, would be the ideal method of treating those cases; but as far as my ability to benefit them at the altitude in which I live goes, I would say that I advise against their accepting treatment from me.

Dr. E. Ross Faulkner, New York City: I call this the irony of

fate, that I have the privilege of saying a few words on the paper read by Dr. Lawrason Brown. I was his patient for a year, and I think that it is largely due to his treatment by rest that I am here today. I know that he believes in rest, for he kept me in bed for a year. I had a tuberculous larynx, and I had to rest it and not talk at all for three months. I am afraid that I was a sorry patient. Nevertheless, through the fact that Dr. Brown has the faculty of making his patients do what he wants them to, I would say I submitted to the treatment. I had numerous visitors, and it was difficult for me to keep quiet all the time. One thing he kept me from, and that is from any one's attempting to touch my larynx by means of suspension laryngoscopy. I do not know that I was weak enough to allow anyone to do that, anyway. Regarding rest, patients may be making progress and their balance may be upset by some slight thing. They may do something which in a person of ordinary activity would not be of importance, but will start them on a downhill course; whereas, otherwise they would have been taking a sure course towards recovery.

Last September a patient aged sixty-seven years came to the clinic with hoarseness, which she had had for four months. She had not lost weight. The only thing seen was an ulcer on the left vocal cord, with gradual infiltration spreading from the cord. I took it for an epithelioma. The other men there thought so, too, and demonstrated the case to the students. We had the Wasserman test done and the lungs examined, but did not have an X-ray made. I proceeded to do a thyrotomy. When I opened the larynx I found that it did not feel like an epithelioma. I removed the cord, and on examining the specimen, I thought it was an epithelioma, although the base did not appear indurated, but section proved it to be tuberculous. After removing it, I closed the wound, leaving a ridge of tissue, which afterwards made a very good cord. She got quite a fair voice, and the result was excellent. The old lady went on her way rejoicing, and is very well today.

Dr. Emil Mayer, New York City: In my clinic, it was our custom to give every patient one of the Yankauer droppers, so that he could make these applications. This, which is a simple apparatus, consists merely of an elongated dropper which is held in the patient's mouth. A little strip of adhesive is placed at the distal end, so that the patient may know just how far to introduce it. Then you can be sure that he always has it in far enough to reach the interior of the larynx. This invaluable little apparatus is particularly cheap, and we have to bear these things in mind. We cannot send all these patients away. They are not financially able to go any distance.

The value of the galvanocautery in these cases recalls a case treated by Dr. Fetterolf. The man made his residence in New York, and came to me because he has, in addition, a tuberculous ear. He had been treated by Dr. Fetterolf, who had applied (by the indirect method, of course) the galvanocautery. It was one of the most astounding things to see that man, the epiglottis, arytenoids and the interior of whose larynx, as the result of the condition that he had had before, were deeply involved, get a clear voice and reach a condition of restored health. On account of re-

current attacks of otitis, it became necessary for him to see me from time to time, so I have seen him for a matter of three years. Every once in a while I look at his larynx to see how things are; and if anyone wants a convincing proof of the value of galvanocautery, all he needs to do is to see a case of this kind, on which I must compliment Dr. Fetterolf.

Dr. Lee Wallace Dean, Iowa City, Iowa (closing): Every case of laryngeal tuberculosis should be placed under the care of a tuberculosis expert before the therapeutic procedure is advised. The laryngologist should recommend to this expert on pulmonary tuberculosis what in his judgment would be the proper treatment of the larynx, basing his opinions on his findings. The pulmonary expert should be the one to advise whether the treatment suggested should be carried out or not.

"Mucocoele of the Nasal Accessory Sinuses; Two Cases of Pansinus Involvement With Recovery After Interval Operations."

By Virginius Dabney, M. D.,
Washington, D. C.

The various theories as to the etiology of this affection are presented: Injury, congenital showing of the duct, and a high deviation of the septum are given.

It is essentially an affection of the young, although the two cases presented by the writer were 25 and 62 years old, respectively.

It is not especially remarkable that the symptoms of mucocoele should be so seldom seen or felt until late. While the affection is principally that of the frontal sinus, similar conditions exist in other sinuses. So slowly and insidiously do mucocoeles develop that no symptoms are noticed by the patient before the tumor formation is advanced, or the retention of a large mass of mucus is established. There is absence of pain. Pressure symptoms are most marked.

In the early stages a diagnosis of mucocoele is practically impossible. When further advanced, and there is loss of visual power with diminishing of the visual field, the diagnosis is more simple, especially when the radiograph is employed.

It is not always easy to differentiate these from malignant tumors, and often an examination of the contents becomes our only resource. Empyema is more difficult to differentiate than any other condition. The severity of the symptoms, pus in the nose, and the patient's distress are of help in differential diagnosis.

The prognosis of mucocoele is uniformly good, and the treatment radical operation with drainage.

The writer presents the histories of two cases of this affection.

1. Female, 25; had asthma, nasal stoppage, burning, subject to colds, and of about six years' duration. Had had polyps removed. Pressure over the brow and antrum painful. Lids slightly swollen. Killian operation; later a double Luc-Caldwell operation was done and the same type of disease found in the antra as had existed in the frontal sinus. She had lost her asthma and her discomfort.

The second case was a woman 62 years old. During thirty years

she has had numerous operations for the removal of polypi and ethmoid disease. She had asthma, numbness over the top of the head, fullness in the cheeks, constant severe headaches. Examination with the Roentgen rays confirmed the diagnosis of pansinusitis. Bilateral Killian operation showing many cysts and much thick, yellowish, bloodstreaked mucus. Four months later a bilateral Luc-Caldwell operation showed similar conditions in the antra.

These two cases present the classic symptoms and the extraordinary features that make mucocoele of the nasal accessory sinus an interesting study. The nature of the growths, the type of secretion, the long duration and insidious development, the lack of insistent symptoms, distention of the cavities, were all present with an almost total absence of constitutional signs. In both radical operation effected cures.

DISCUSSION.

Dr. Otto T. Freer, Chicago, Ill.: If the uncinate process is the subject of an inflammatory swelling, as it often is during antrum, ethmoidal or frontal sinus suppuration, it impinges upon the lower border of the middle turbinate, lying in contact with it, so that it completes the floor of the recessus frontalis, making of it a partly or completely closed cavity. Secretions are then more or less retained in the recessus, according to the amount of uncinate and associated swelling. My experience has not sustained the usual idea that antrum suppuration is secondary to the frontal sinus suppuration in these cases, the frontal sinus "draining into the antrum." Chronic antrum suppurations are in my experience nearly all of dental origin and the frontal sinus abscess follows that of the antrum. In aggravated cases of this sort the maxillary antrum, the recessus frontalis and the frontal sinus form one continuous lake of pus that drains under pressure through small fissures into the nasopharynx.

Should the uncinate process and middle turbinate for any reason become adherent, the recessus frontalis becomes a closed or nearly closed cavity and its bony walls and those of the frontal sinus and antrum are then subjected to chronic slight pressure from the fluid distending this cavity which escapes with difficulty, if at all, the result being a mucocoele which is the most conspicuously evident where it affects the frontal sinus, because the floor of the frontal sinus, which is the roof of the orbit, being a thin, weak place, gives way, becoming absorbed with resulting displacement of the eye outward by the distended sac which takes the place of the firm frontal sinus floor. If the fluid distending the mucocoele cavity becomes sterile, it contains merely mucus. I have observed two of these cases. In one of them the chronic pressure of the contents of the mucocoele had led to absorption of the bone of the adherent uncinate process and middle turbinate, so that they formed a sac that depended from the middle meatus region and could be easily opened widely with a knife. A great deal of fluid gushed out. Exploration then showed disappearance of the orbital floor of the frontal sinus with enlargement of the natural opening into the antrum, so that it would admit a finger. The eye was

displaced outward and downward to an extreme degree. While the broad drainage of the mucocoele created caused it to disappear, the eye displacement remained permanent.

The second case was seen casually in the practice of another man and I do not know the result of drainage of the mucocoele upon the eye displacement.

Dr. C. G. Coakley, New York City: Within the past fourteen years, I have had two cases that were diagnosed as mucocoele. One was a patient on whom about ten or eleven years before I performed ethmoid exenteration for orbital cellulitis. The patient had been operated on a few days before by a confrere in New York. After a partial exenteration of the ethmoid, this orbital cellulitis developed very promptly, and demanded immediate operation. I cleaned out his ethmoid only. I exenterated the ethmoid only along the nose, like the second half of a Killian incision. The membrane in the frontal sinus was thickened, and there was some accumulation of pus. The patient had asked to have very little deformity caused. I was doing, as an experiment, that type of operation, hoping to get sufficient drainage from the frontal sinus to prevent having to do a complete Killian operation, or radical operation on the frontal sinus. The patient made a good recovery from both the frontal inflammation and the ethmoidal. For a long time one could pass a probe into the frontal sinus and wash it out, until all secretion had ceased. He disappeared from view, owing to residence in another country; but he returned at intervals for examination, and transillumination showed that all evidence of frontal sinus involvement on that side was absent. He returned again in June, a year ago, while I was away, and consulted a confrere in New York. He had a marked bulging in his forehead, and downward and outward displacement of the globe of the eye, which had been going on for several weeks.

The diagnosis of mucocoele was made. The frontal sinus was opened, and the membrane only partially removed, giving temporary relief; but a permanent fistula discharging pus resulted. In November he came into my hands again; and I completed the operation, cleaning out the right frontal sinus. There had been a perforation of the interfrontal septum, so that the pus extended into the left frontal sinus. The patient made a good recovery. Considerable membrane remains in the right frontal. Nothing has been touched in the left frontal. There was an inflammatory process going on in the membrane.

If you want to call these conditions mucocoeles, all right; but I think that the pathology is that of a chronic inflammation of the mucous membrane, without bacteria present, or with a low-grade bacterial content, which has become devitalized so that we cannot get a growth. For some reason—perhaps, owing to the explanation given by Dr. Freer, that of some previous injury—there has been an interference with the passage of the secretion of the nose. There has been an obliteration of the nasofrontal duct, and the result is a gradual accumulation of pus with bone absorption. If you look on it as a chronic lowgrade inflammatory process, you can understand better what is going on in these cases. In the first case, fibrous tissue had grown across the floor of the frontal sinus,

so that no probe could be passed up into the frontal sinus. That I satisfied myself of three or four years before the present attack. The process had been that of chronic inflammation, where the outlet had been obstructed with some anatomic disturbance—possibly inflammation and possibly trauma.

Dr. Lewis A. Coffin, New York City: What I have understood as mucocoeles are cavities confined to the ethmoidal tract, which contain a sort of oysterlike sterile masses. They may extend into and involve the frontals. The interesting thing is the absolute destruction of all the natural cell walls of the tract and the extension and enlargement of the limiting wall of the cavity. That is the real wonder to me. I suppose it is due to action of the osteoblasts and the osteoclasts, but how they work so as to preserve the even thickness of the retaining wall is altogether beyond me. I do not know how it differs from the cystic turbinate, which we find more frequently in the female than in the male; nor again do I know whether it is comparable to the cyst that we find in the jaw. We have seen cysts in the lower jaw as large as a robin's egg, which had evidently started from some diseased tooth. I was wondering whether, if, as Dr. Freer has suggested, the condition commences in the antrum and spreads upward, the infection may not come from the teeth. The antrum is so often infected from a diseased tooth that this origin seems possible. If so, this would mean that we have an aseptic cavity which had its origin in an infective process. The cases that I have seen generally presented a tumor between the nose and the inner canthus of the eye. Of course, this tumor was hard; because of the limiting bony wall. In one case the X-ray showed the existence of a mass as large as a hen's egg. When operated, it was found to be an osteoma. What is the chemistry that determines whether the growth shall be the one or the other, I do not know.

Dr. Hill Hastings, Los Angeles, Cal.: Dr. Dabney made the statement that the existence of sarcoma with the diagnosis of mucocoele is not uncommon. Some years ago I reported before the American Laryngologic, Rhinologic and Otologic Society three cases of mucocoele, in all three of which a diagnosis of sarcoma had been made. In two cases the mucocoele had been shown up externally in the orbit, the third case was believed to be a mucocoele of the antrum. It caused a bulging of the anterior wall of the maxillary sinus with rotation of the teeth. On operation the cyst filled the whole antrum except a very small area at the upper, outer angle. I have since doubted my original diagnosis of mucocoele of the antrum and believe that it was a denigerous cyst that almost filled the antrum. The orbital growth were, however, true mucocoeles.

Dr. Joseph H. Bryan, Washington, D. C.: There is a condition known as mucocoele. Just what the actual pathology is, I am not able to state; but undoubtedly it is an accumulation of pure mucus, due to a low-grade inflammation that has not gone on to suppuration. It is caused by a plugging of the cavity, and I believe is a pathologic condition.

Dr. Thomas J. Harris, New York City.: I should like to report a case of pneumocoele. The man was a Russian, thirty-three years

of age, who complained of crackling in the frontal region and vague pain over the head. There was a sense of fluctuation over the mass. The nose showed distinct ethmoiditis. There was a history of considerable time in the development of the disease. No swelling was seen beneath the orbit. The X-ray showed distinct frontal sinus disease. The diagnosis was not made. I thought that it was frontal disease, plus something else. Radical operation showed, first, a distinct air tumor with a very small opening into the frontal sinus, which was filled with pus, and a solitary sinus, not the left sinus at all; and an occluded nasofrontal canal. It would seem that the trouble had begun in the nose and proceeded up into the forehead.

Dr. Virginius Dabney, Washington, D. C. (closing): Dr. Freer's explanation of the condition is blocking of the natural outlet, which seems perfectly reasonable and is seen frequently. Dr. Coakley starts out by saying that there is really no such condition as mucocele, but he really doesn't mean this, as he later lays down a rule which covers the cases perfectly. He does mean that many of the cases so reported are not of this type; thus, the first case he refers to was certainly not a mucocele, and I doubt if the second one was. The sterility of the growths and the cavities of which he speaks is absolutely true and one of the diseases's striking peculiarities. A growth cannot be obtained from any attempted culture. Dr. Coffin speaks of finding very often a bony cyst filled with semisolid matter; this is interesting and falls within the domain of my subject. Likewise the enormous destruction of bone which he notes is similarly characteristic. Dr. Coffin's characterization of the contents as an "oyster-like" is especially graphic; nothing so well describes the growth. A cystic turbinate is one stage of a mucocele. Dr. Hastings speaks of sarcoma as one of the confused diagnoses, and he is entirely correct in his position. In the mass of literature through which I waded in preparing my paper, I found in the British Medical Journal an illustration under the heading, "Educational Mistakes." It was the picture of a man who looked like one of the gargoyles which peer down at you from Notre Dame; the most appalling deformity I've ever seen. This had been calmly accepted as a sarcoma for three years, being in reality a mucocele. I read Dr. Bryan's article, which was about 15 years in advance of its time. Hydrops antri is a term not to be tolerated. Pneumatocoele referred to by Dr. Harris is spoken of more by the French than any others, and was not touched upon by me owing to its rarity and ease of differentiation, chiefly by the crepitation and lack of local and constitutional signs.

Aspergillosis of the Maxillary Sinus.

By Ross Hall Skillern, M. D.,
Philadelphia, Pa.

James B., a large man about fifty years, presented himself with vague symptoms referred to the left maxillary sinus. Some unilateral, apparently nonfetid, nasal discharge, a feeling of fullness over the left antrum, vague head pains, entirely atypical of sinusitis. No periods of congestion or depression and no postnasal discharge. Some cacostmia at times, but never marked.

Examination revealed a slightly congested, lateral nasal wall, otherwise normal. A needle puncture of the maxillary sinus was made and considerable resistance was offered to the ingress of the normal saline solution. Being mindful of the fatalities reported by Gording following needle puncture in which there almost invariably was difficulty in forcing the irrigating solution into the sinus, I proceeded with the utmost caution, watching the patient closely for the appearance of any untoward symptom. Despite the continuation of gradual pressure, nothing developed, nor did any liquid escape from the nose, either anteriorly or through the choanae into the pharynx. As the resistance seemed to be lessening, another syringe of fluid was tried and almost immediately some fluid returned from the nostril on that side. It appeared slightly turbid but no free pus was observed. After injection of at least sixteen ounces, there appeared in the washings small, white inspissated masses, which resembled cottage cheese. It immediately occurred to me that we were dealing with a case of cheesy metamorphosis of a sinus empyema, of a so-called "Verkäsung," which, of course, is a condition where the purulent secretion has been sterile and begins to organize into a semisolid mass. Continued lavage, which now was returning quite freely, brought forth considerable quantity of this cheesy material, some of which was set aside for pathologic investigation. Lavage was continued until the antrum was free, the injected fluid returning clear. The patient expressed himself as greatly relieved, saying his head felt lighter than it had for a long time.

He did not return for nearly a week, when further needle puncture and lavage were negative, the patient feeling quite well. He was to report should any of his old symptoms reappear, but as several months have now elapsed, we can consider the case as cured.

The pathologic examination by Dr. Case gave the following findings:

"The specimen was small, soft and possessed no characteristic appearance that might have suggested the diagnosis. It had been placed in formaldehyde solution, so that a cultural study was, unfortunately, not possible. Following the usual routine, it was imbedded in paraffin, stained with hematoxylin and eosin and examined histologically.

As may be seen in the preparation under the microscope, it consists of a close mycelial network with an occasional conidiaspore, surmounted by a fanlike arrangement of conidiaspores. The hyphae take a faint pink stain, but the fructifying bodies are yellowish in color, apparently resisting the penetration of the dye. Diagnosis: *Aspergillus*, probably of the species *fumigatus*."

Dr. Lee Maudment Hurd, New York City: I saw a woman fifty years of age, who came to me for some obstruction of breathing. She had a deflected septum and the usual signs of chronic nasal catarrh. Transillumination showed the left antrum to be dark. I washed out this antrum, and got slightly cloudy fluid with strips like cotton fibre. This fluid showed *aspergillus* with *bacillus pyocyaneus*. She gave no symptoms of this condition whatever. Being a nervous woman, she insisted on a cure. I washed the

antrum out with saline, and later injected it with silver. Then I opened the antrum and instituted intranasal drainage—all with no effect. There was always turbid fluid looking like cotton fibre. I cannot remember all the different antiseptics I tried without success. At last, I inflated it every day with equal parts of boric acid and aristol; and within a week it cleared up. We could not quite identify the parasite, but it was present in every washing.

Case of Intranasal Ethmoid Exenteration Accompanied by Uncontrollable Hemorrhage. Death.

By Dunbar Roy, M. D.,
Atlanta, Ga.

A male aged 18 had a suppurating ethmoiditis with numerous polypi. Operated on the left side with uneventful recovery. Four months later the right side was operated upon. Four days following this there was hemorrhage from that side readily checked. Two days later a severe hemorrhage occurred from both sides for which the nose was tightly packed. Ten days later free bleeding again from both nasal cavities. The blood always clotted freely. The greatest bleeding seemed to be from the left side, and the nose was packed. Blood still oozing, the left common carotid was tied under anesthesia.

Five days after this hemorrhage from the neck incision and again the following day.

It was decided to open the incision in the neck and tie the bleeding vessels. The patient took but a few whiffs of gas when he stopped breathing. No autopsy was allowed, but the incision in the neck was opened and all of the neck muscles and fascia were undermined and an immense cavity found filled with clotted blood. The suture on the carotid was firm and there was complete ligation.

No blood examination was made as the blood clotted freely and it was expected that the hemorrhage would be controlled.

Evidently a slow bacteremia had been progressing for some time due to the absorption for years of pus from the ethmoid cells, and this had undermined the coats of the blood vessels as well as the integrity of other body tissues.

While the immediate cause of death was the general anesthetic, this would not have produced death had there not been such an excessive loss of blood and the whole system in an abnormal state.

This unfortunate termination emphasizes the great danger of these extreme cases of necrosing ethmoiditis.

Neuralgias of the Trigeminal Tract and Facial Neuralgias of Other Origin—Impressions Derived from a Survey of 555 Cases.

By Charles H. Frazier, M. D., Sc. D.,

Surgeon to the University Hospital, Philadelphia.

Major trigeminal neuralgia is the term that would be proposed as descriptive and distinctive, and in order that there may be no misunderstanding as to what is implied, the following brief sketch is its distinguishing and characteristic features.

Appearing suddenly and without any apparent exciting cause and with few exceptions after middle life, a sharp, shooting, stabbing, lancinating pain is experienced at first in one of the three divisions of the trigeminal nerve, usually the second or third.

The pain is likened by the patient to an electric shock, to a boring hot iron, to the tearing of flesh. The distribution of the pain has definite anatomic limitations, and without variation is referred to the terminal distribution of the nerve involved to the lips, gums, tongue, teeth, nose, forehead. The pain comes as a bolt from the sky and vanishes like a shooting star. "Attacks" indicate certain periods of time during which the patient is subject to paroxysmal seizures. The attacks are of varying duration, a week or two at first, and two or three in a year, but as time goes on the attacks are of longer duration and of greater frequency. The pain of renal and biliary colic is of great intensity, to be sure, but controlled at least in part by morphin. Not so the pain of trigeminal neuralgia. The habitual use of morphin is presumptive evidence that the patient is not a subject of the disease under discussion.

It would seem that peripheral infections, including sinus diseases, played no part in the etiology. These convictions have been forced upon me by a critical analysis of my clinical experiences. On my records there are only three instances in which either at the time of my first observation or previous thereto, had the patient been under treatment for sinus disease. For a hundred years and more the etiology has been a matter of speculation and we are as far today as ever from any clearcut conception or any convincing data as to the prevailing cause.

The following is a brief summary of observations upon types of neuralgia: We recognize, first of all, a definite clinical entity in what we prefer to call "major trigeminal neuralgia," the symptoms of which are so characteristic that a diagnosis can be made that should admit of no discussion. The etiology is still a matter of speculation. We recognize other neuralgias in the distribution of the trigeminal nerve that have a specific cause, some of them stimulating the major type, such as (1) the neuralgias due to tumors involving the sensory root, the ganglion or its several divisions; or (2) the neuralgia following herpes zoster. We recognize a third group of neuralgias, involving chiefly the ophthalmic division, that we believe to be of toxic origin; symptomatically they have nothing in common with the major type. We recognize a fourth or miscellaneous group in which the pain, though of great intensity but not paroxysmal, is referred chiefly to the orbit, temple and cheek, sometimes to the neck, associated frequently with general headache or hemicrania; a group in which our suspicion has been aroused as to the part the sympathetic system may play in its origin. Finally a group which we classify under the psychoneuroses or psychalgias.

In discussing the treatment of major trigeminal neuralgia, restricting the remarks chiefly to experience with the major operation, of these there have been 204 avulsions or sections of the sensory tract, 5 complete excisions of the ganglion and 5 partial excisions of the ganglion. The major operation has long since been robbed of its terrors; the mortality, once 5%, has been reduced to less than 1%, there having been but one operative fatality in the last 177 cases of my series. In the vast majority the patients, as one would anticipate, express complete satisfaction with the results.

At one time or another, I have introduced certain variations, to

which I will refer in passing. For a while I have substituted section of the root for avulsion but to no advantage. In a few instances I have left intact the inner fasciculus of the sensory root, when the ophthalmic division was not involved, in the hope that by so doing trophic keratitis might be avoided. I am now awaiting results; should in the course of time there be any recurrence in the series, this modification will have to be abandoned. Latterly I have been able to conserve the motor root and thus prevent the atrophy of the temporal muscles, which hitherto interfered with a perfect cosmetic result. This modification, furthermore, now makes it possible to operate on both sides in bilateral cases. All the technical difficulties have been mastered and the operation is now one of the most satisfactory the neurosurgeon is called upon to perform.

DISCUSSION.

Dr. Greenfield Sluder, St. Louis, Mo.: In the course of Dr. Frazier's paper he spoke of the sinuses of the perinasal space, as, in all probability, not being the cause of trigeminal neuralgia. I have seen three such cases—at least, three that I thought were such cases. One was sent to me by Dr. Halsted, who can tell more of the story than I can of sphenoid suppuration, on which he operated and got relief for a year. Then the patient returned, and ultimately come to a Gasserian ganglion operation. I had a case of tic that was relieved by a simple operation on the sphenoid. This was only a short while ago, and may be considered as not finished. He may have further trouble. I have another case that was relieved some years ago, and has not returned; but my experience with trigeminal neuralgias, as described by Dr. Frazier is negligible. That is, my own experience. I have, however, repeatedly seen what I thought was major trigeminal neuralgia exhibit a sticking pain. There was a lowerhalf headache and pain, as a constriction about the eye, the upper jaw, the teeth, the ear, and the mastoid, almost more than back of the mastoid, with a point of tenderness attached. The shoulder blade, the arm, the forearm and the fingers were also involved. It was nearly a complete case, when it went down to his elbow. It repeatedly proved to be controllable by the nasal ganglion; by cocaine injection relieved it for a year and a half. Then an attack of coryza reestablished the pain, and it passed off in the wake of the coryza. Later, he developed another coryza, which reestablished the pain; and it did not pass off. It was injected a second time, and the patient has not yet had a recurrence. Pain of nasal ganglion origin can always be reestablished by virtue of the fact that the ganglion remains in the tissue superficial to the nose, and may be irritated again by inflammation in the nose. I think it is as well to put in here as elsewhere the question of a psychologic estimate of these cases. Dr. Cushing, last summer, gave three papers. In these articles he spoke of this lowerhalf headache and mentioned a case in which the pain was from the major neuralgia of the trigeminus. He expressed to me in conversation the opinion that these were all spilled over; and he put in the text the view that there is no reason to assume that the nasal ganglion is responsible for this

symptom complex. He thought that it was more rational to assume that the second division of the fifth nerve was the origin of the pain and that it was spilled over. It is difficult or impossible for me to understand how these can be cases spilled over from the trigeminus, from my experience of Dr. Cushing's cases. He most kindly showed me some of these cases in the beginning of my observations, in 1909. I had seen enough to justify me in describing nasal ganglion cases, but my experience was that of a beginner and I did not understand his cases at the time; and I do not quite understand them now. A woman from whom he had removed the Gasserian ganglion at the distribution of the headache had a most violent headache, with sphenoiditis; and I opened the sphenoid, with instant relief from the frightful headache. I tried to open the sphenoid by a comprehensive opening, but could not get through by my customary technic; because the bone was so thick and hard. I used an eight-inch drill, and succeeded; but the hole closed up in a few days. I did not do any more comprehensive surgery. Some time later I heard that she was suffering about as much as before. That pain was not spilled over from the trigeminus, because the trigeminus was gone. Nor can these cases be explained by segmental overlapping, however, when the trigeminus was no longer there. I have done a dozen ophthalmoplegic migraines, in which the sphenoid was operated on with relief. To my mind, these cases are explicable by virtue of thin bone, which separates not merely the optic nerves, but also the third, fourth and sixth nerves. If these cases, then, be of sphenoidal origin, and explicable by the thin separation of the lining nerve trunks, that can readily recur for the same reason that established it in the beginning. You cannot change the thickness of the bone separating it or give more protection to the adjacent nerves.

Dr. Frazier spoke also of pain that was stopped by cocaineization of the sphenopalatine or nasal ganglion. The fact of pain transmission then arose in my mind. The question of the sympathetic comes in; and it seems to me that, as no other nerve connection is available, it must then be assumed that the sympathetic, if not under normal conditions, at least under abnormal, becomes capable of afferent transmission. The literature on the subject of the possible sensory attributes of the sympathetic is very extensive.

Dr. Ross Faulkner, New York City: Dr. Frazier has established the surgical procedure, and has shown the world its great value in relieving suffering. Also, he has reduced the mortality from over 22% to less than 1%. Dana, some years ago, writing on tic douloureux, mentioned the fact that a case of two years standing can be cured by castor oil. I thought that there might be some truth in it; and in the cases that came to me, I tried it. To my surprise, some got rid of the pain for quite a long period. The method employed is almost as severe as operation. He gave it every night. It is, by all means, worth trying, and there is no doubt that some cases will get rid of the pain from that treatment.

The etiology of this thing has been very much of a mystery, and I have never been able to get any light on the solution of it. It occurs in all classes, the poor as well as the rich.

The method used by me for alcohol injection was practised for a long time by splitting the head of the cadaver and taking out the nerve. By using a good deal of cocaine, and employing a needle with an abrupt bevel to it, I was able to determine if the point of the needle was in the nerve. I used three or four drops of cocaine for anesthesia. Not more than ten drops of alcohol was used for that sort of injection. In a large number of cases there were permanent results. I have six cases, at least, that have never come back. The majority come back within a year, or even six months.

In the second division, I have not had satisfactory results. You cannot get into it, but must put the alcohol around the nerve. But in the third division, you can do so, and work easily into the substance of the nerve and get complete anesthesia with the injection of alcohol. The good results secured by this method justify its being tried in all cases in the third division. All cases should be treated with castor oil first; and then, if this fails and especially if they are confined to the third division, inject alcohol into the nerve. Continue to try a number of times, until you get in. With the first or second division, it is difficult to get a result, unless one injects the ganglion. I had one case in the first division alone which I did the ganglion injection with alcohol. I have had two such cases. I should not recommend it, however, because if the direction is not right, you might get into the cavernous sinus or the carotid artery.

Dr. Charles H. Frazier (closing): I should be disposed to agree with most of what has been said in the course of the discussion. To one remark I should, however, take exception. Dr. Sluder referred in his remarks to a case of "low grade tic." In my opinion there is no such thing. A correct diagnosis of *tic douloureux* presupposes a violent, excruciating pain—a pain of great intensity and severity. With regard to *tic douloureux* or the major trigeminal neuralgia there should be no conflict of opinion as to its recognition. It is quite distinct from that variety of neuralgia—sphenopalatine neuralgia, if you choose—to which the discussion this afternoon has been chiefly devoted. That the latter may be of sympathetic origin is not unlikely. Not until in suitable cases we have excised the sphenopalatine ganglion can we speak with any positiveness as to the part this ganglion, with its sympathetic connections, plays in the etiology. Alcohol injection of the sphenopalatine ganglion for obvious reasons is not comparable to injection of the Gasserian ganglion or its divisions.

In my address, I did not touch upon the subject of alcohol injection for the relief of trigeminal neuralgia. The subject is too big to discuss in a cursory way. In the management of patients I never urge one or the other method—alcohol injection or operation—but after laying the facts before the patient, leave the choice to him. In nine cases out of ten, if he has suffered for only a year or two, he will choose the injection; if for a longer time and he has had already several injections, he elects the operation.

I cannot agree with the statement of Dr. Faulkner as to variations in the period of relief following injections of the second and third divisions, nor do I agree with him in his prohibitive attitude towards injections of the ganglion. In very old people, in the

exceptional case where there may be some contraindication to operation, when the ophthalmic division is involved, and in cases of inoperable carcinoma of the face, I have not hesitated to recommend and practice ganglion injections. Particularly in the cancer group have I found these injections so welcome. By enabling the patient to eat without pain and to sleep without morphin, life for the time is quite transformed.

Nasal Tuberculosis.

By William B. Chamberlin, M. D.,
Cleveland, Ohio.

Nasal tuberculosis is rare, but the primary form not as rare as ordinarily supposed. There is still some confusion in use of terms lupus and tuberculosis. Zarniko's classification into proliferative and ulcerative types is probably simplest and best. Zarniko thinks that the term lupus should be dropped, though Killian still clings to this term on account of the attenuated form of the infection and the chronicity of the involvement.

Symptoms are usually those due to nasal obstruction with increased secretion. Pain is rare. Bleeding and crust formation is occasionally present.

The place of predilection is usually the cartilaginous septum, inferior turbinal, nasal floor and lateral nasal wall being next in order. Bone involvement is secondary. Infection may be due to inhalation of infected air or to a direct lesion from the infected finger nail.

Tubercle bacilli are always rare and may not be found at all. Presence of giant cells in fields of epithelial and lymph cells establish the diagnosis, even though typical tubercles and tubercle bacilli are not found. Typical miliary tubercles with centres of cheesy degeneration are pathognomonic.

Differential diagnosis from syphilis, malignancy and foreign body with granulation tissue is presented.

Treatment is surgical removal, with subsequent application of lactic acid or superheated air.

DISCUSSION.

Dr. Emil Mayer, New York City: I am one of those who still feels that we should keep up with the term lupus, because there is a great big difference between tuberculosis and the attenuated form of tuberculosis that we call lupus. In the cases of lupus of the upper air passages that I have cited, and which I have watched patiently for eighteen or twenty years, I feel that I was justified in adhering to the original term. Why not consider the fingernail infection? These are cases in which the disease appears in the area that could easily be reached by the fingernail on entering the nose. There is another form that cannot be classed among the ulcerative or tubercular. In the cases cited Dr. Chamberlin spoke of either a destruction or a form of new growth. We have the lymph exudative forms, and I have seen cases of that kind of tuberculosis of the nose in which the only symptom was that of repeated attacks of laryngeal spasm. Examination showed yellow exudate, which eventually showed miliary tuberculosis; and the patient went to pieces rapidly. In one case I made a diagnosis of tuber-

culosis in a young woman whose only evidence was a yellow exudate on the inferior and posterior portion of the uvula. Now the importance of making a differential diagnosis between lupus and tuberculosis, to my mind, is, in the first instance, the importance to the patient of the fact that you can tell him that he does not need a change of climate and will be just as well off at home as anywhere else; and, in the second, the importance to the patient of being relieved from any fear of the possibility of contagion, so far as his carrying the disease to anyone else is concerned. Why not treat them with the galvanocautery? That can be as safely done in the nose, and the conditions as thoroughly eradicated, as anywhere else, and with less danger from having an open wound in a tubercular patient and have a recurrence of his condition. I should like very much to have Dr. Chamberlin ultimately report what has happened to the second case. That patient, as I understood, had millary tuberculosis; and I regard this as a most dangerous sort of condition to the patient, who may succumb in a very short time.

Dr. Lee Wallace Dean, Iowa City, Iowa: During the last two years we have been studying cases of chronic suppuration of the paranasal sinuses suffering from pulmonary tuberculosis. A similar investigation of chronic otorrhea in this class of patients showed that many of the mastoids were tuberculous. To our surprise we found that tuberculosis of the paranasal sinuses was a rare thing unless it was secondary to bone tuberculosis in the neighborhood of the diseased sinus. We have not found a single case where the sinus disease was tuberculosis unless it was secondary to bone tuberculosis. In one case of chronic maxillary sinus disease the purulent discharge contained acid fast bacilli and produced tuberculosis when injected into a guinea pig. Careful microscopic examination of the lining of the sinuses and the surrounding bone showed that there was no tuberculosis of the sinuses; that the bacillus tuberculosis was present as an accidental contamination.

Dr. B. Alex. Randall, Philadelphia: I want to mention a case of tuberculosis, which more or less completely involved the nasal chambers themselves. Many of the teeth were loosened. These were all removed, and curettement of the alveolar processes carried out with the removal of much of the nasal mucosa by Harrison Allen, who had charge. The patient survived for twenty years or more.

Dr. Lee M. Hurd, New York City: I wish to report some cases of mistaken diagnosis. One of these was a case of so-called lupus—lupus of the lip and vestibule. Sections were found by one pathologist to be tubercular. Dr. Jonathan Wright doubted this, and said that granuloma from syphilis and from tuberculosis could not be told apart under the microscope. The case cleared up under mixed treatment. Other cases that were diagnosed as tubercular all cleared up under antisyphilitic treatment. They were all in the anterior part of the nose.

Dr. William B. Chamberlin, Cleveland (closing): With regard to Dr. Mayer's insistence on the term lupus, I personally cannot see any great justification for that term. Dr. Mayer did not hear

my remark about the finger being the most probable cause of infection; airborne infection being the one most insisted on, and the fingernails being the most probable cause of infection. The type of cases he mentioned, I am glad to know of. I did not know anything of that type of case. His suggestion in regard to treatment is apropos. I think one should be careful in the use of galvanocautery, not to carry the cautery so deep that the cartilage becomes involved.

In many cases I made a probable diagnosis of tuberculosis, which was ultimately confirmed by the pathologist.

In regard to Dr. Dean's reference to tuberculosis in sinus cases, I would say that I have not found it in such cases.

Some Observations on Localized Pulmonary Suppuration, Treated by Endobronchial Irrigation.

By Charles J. Imperatori, M. D.,
New York City.

Lung abscesses may be divided into three classes, those that are caused by aspiration, by embolism and another type, possibly a tubercular cavitation with a secreting lining of infecting organisms. Observations were conducted on seven cases, two being alive and still under treatment. Of the five deaths, one died from a carcinoma of the bronchus, one was operated elsewhere, that is, a pneumectomy was done, but the patient succumbed on the table and the other three cases died from an intercurrent pneumonia.

Of the five cases that died, four were autopsied and proven, beyond doubt, to be tubercular; one being a carcinoma with a tuberculosis. All of these cases were repeatedly examined, careful sputum analyses made, fluoroscoped, radiographed and decided that they were probably not tubercular and referred from either the medical, surgical or tubercular wards as cases for treatment. The remaining two cases, clinically, have the same characteristics that the other five had.

Simple bronchial irrigations, in the writer's opinion, in the control and treatment of lung abscesses of this type, are of little use. It is very possible, with the use of the spiral irrigating tubes of Lynah, better results may be obtained and this method shall be pursued in subsequent cases. Various medicaments were used in some of the early treatments of these cases, such as iodoform emulsion, iodine in olive oil, tincture iodine, weak Dakin solution—one and ten, and boric acid solution. All with negative results. Warm saline solution and the injection of olive oil, impregnated with the 5% bismuth, seemed to be as efficacious as anything.

Idiopathic lung abscess, and by that is meant that type of abscess other than that directly traceable to aspiration or trauma of some foreign substance, or the embolic abscess following some surgical procedure, is possibly a tubercular cavitation with a lining area of pyogenic organisms. This can not be given as a definite conclusion and is merely suggestive from these personal observations and must be proven by a larger series of cases.

DISCUSSION.

Dr. Emil Mayer, New York: A patient with a purulent condition in his bronchus is a most unhappy individual, and anything that can be done to relieve these patients is of such value that it should receive every bit of recognition possible. As Dr. Imperatori says, not enough of this work has been done to enable one to state definitely what particular remedy is going to be of the greatest advantage. There is one thing, however, that I wish to call attention to, and have called attention to, in regard to this same subject, and that is the need of a certain amount of care in not doing irrigations too frequently. These patients receive, as a rule, a hypodermic injection of morphia, and require a fairly strong solution of cocaine to render the bronchus as free from cough and irritation as possible. It must be borne in mind that while we have a dreadful disease, yet we have no right to inflict on these poor individuals, in addition to their other suffering, either the morphin or the cocaine habit.

Dr. George Richards, Fall River, Mass.: I should like to ask what objection there would be to making a direct opening into the lung, resecting one or two ribs, and getting direct outward drainage? I had a case in which I was doubtful whether it was tubercular or not. The general surgeon, under general anesthesia, resected the ribs and drained the abscess outwardly; and although the girl had suffered for two months, she slowly and continuously got well, and is at work at her occupation. Is there more risk from the surgical operation of making an opening directly into the lung? It is more or less disagreeable to the patient to make these irrigations. The technic must be of considerable difficulty on the part of the operator.

Dr. Henry L. Swain, New Haven, Conn.: Dr. Richards' question of an opening on the outside presupposes that you can readily discover where the abscess is and can get at it from the outside. I have run over a couple of cases in which that was not easy, even after the injection of bismuth. That couldn't always be done with any degree of safety or accuracy.

I should like to ask Dr. Imperatori how much trouble he has in getting his patients accustomed to the dosage? He spoke of it as though he always operates on the recumbent patient? I have sometimes thought that if I could get the patient to sit up so that the stuff would stay in better than when lying down, it would be a good thing.

Dr. Henry L. Lynah, New York City: I believe that most of the lung abscesses are due to aspiration, because all of the surgeons agree that embolic cases die rather early. The patients which I have had the good fortune to bronchoscope are all still alive. In washing out the abscess cavities, as advised by Yankauer, I never have been able to recover any of the solution by suction, for it is always coughed out through the bronchoscopic tube mouth as fast as it is injected. Personally I believe that the dilatation of bronchial stenoses and the establishment of proper lung drainage is what improves the cases. I only use suction after bronchoscopic dilatation, and seem to have obtained some results. Bleeding, edematous and fungating granulations are always touched with 10

to 20% nitrate of silver. As to the injections of bismuth subcarbonate in olive oil, that was not done with any idea of curing the cases, but was purely for purposes of definite localization of the abscess cavity. All of the patients, however, improved. Dr. Wm. H. Stewart attributed the improvement to the secondary action of the X-ray on the metallic substance in the lung. We have had bismuth remain in the lung for ten months after injection, but often when the bismuth disappears the abscess is healed.

In cases following tonsillectomy early bronchoscopic examination is always indicated while the process is in the pneumonic stage, and before definite cavitation has taken place. We have had some startling recoveries in these early cases after removal of sloughs from the edematous bronchus and bronchial dilatation and aspiration.

Dr. William B. Chamberlin, Cleveland, Ohio: Dr. Lynah's remarks illustrate a case of mine in which removing granulation tissue and plugging one branch proved beneficial. This boy, 18 years of age, had given a history of purulent expectoration since he was six years old, probably produced by a foreign body. We could find no evidence of it. If it was a foreign body, it gave no shadow on the plate. Subsequent to the injection, the purulent discharge decreased decidedly, and the odor almost entirely disappeared. There was marked improvement after such treatment, no bismuth being used. He had gained ten pounds in weight, and the odor had entirely disappeared.

Dr. R. B. Canfield, Ann Arbor, Mich.: I would like to add a case of pulmonary abscess similar to the last described by Dr. Imperatori. It occurred in a child of 11 years who had a pulmonary abscess of two years' standing of unknown etiology, from which she expectorated about six ounces of foul pus at intervals of five or six days. The abscess was located in the lower left lobe. It was plainly seen through the bronchoscope, communicated with the bronchus through a small opening, and was lined by foul smelling granulation. Bronchoscopy, aspiration and the use of compound tincture of benzoin secured a satisfactory recovery after several treatments. The satisfactory result of the treatment was confirmed by the X-ray, which showed a steady diminution in the size of the abscess and its ultimate obliteration.

Dr. Harmon Smith, New York City: I should like to ask whether, if in tuberculous, there is danger of hemorrhage; and whether the use of iodine and olive oil would not enable the patient to retain it?

Dr. Charles J. Imperatori, New York City (closing): The point is to find out whether I am correct in my assertion that these lung abscesses may be caused by any other means than by straight aspiration and embolism. All these cases were seen in the wards of Bellevue Hospital. They were not cases that came directly to the otolaryngologic service, but were transferred to it. They were surgical, medical or tubercular cases. They were assumed not to be tuberculous; although several, from the radiographic plate, had been diagnosed as such, and then the diagnosis was changed. I have not had any cases following tonsillectomy. I have not had any embolic cases. In the four autopsies, there

were found distinct tubercles, from the size of a pea to that of a hazel nut, within a centimeter or so of the abscess cavity.

Answering Dr. Meyer, I would say that the patient never gets more than a quarter of a grain of morphin. That is measured in minims. Usually, the patients get six or seven minims of Magendie solution. The amount of cocaine is never more than a dram. The method of cocaineization is with a Cohen applicator. Make an application to the base of the tongue, and then the cushion of the epiglottis. With an applicator syringe at the same time, you touch the larynx and inject a drop of cocaine. Then wait five minutes and do it again. Use an atomizer and spray the trachea with three or four sprays of a ten per cent cocaine. Then, as the bronchoscope is passed, make one application to the carina.

Answering the questions, I would say that I know of one case in which outside drainage was done, and several cases in which olive oil and iodine were used by the general surgeon. I always bronchoscope the patient in the reclining position, and usually employ a 7 m. m. tube. I expect to have a 5 m. m. tube to get into the smaller bronchi. I do not believe that any of the solution stays there, but the reason for injecting the saline solution is to soften up and liquify the pus that I did not seem to be able to suck out with our aspiration apparatus. Following Yankauer's technic, I injected eight ounces and sucked it out. Knowing that Dr. Lynah was injecting these lung abscesses and radiographing them, and hearing that he was curing them, I decided to use bismuth. At first I used bismuth subnitrate; but later I changed it to bismuth subcarbonate. I have never used iodine. In regard to the danger of hemorrhage in tuberculous cases, when I was working at the Riverside Hospital, I irrigated a number of abscesses, with negative results. If any cases showed a tendency to bleeding, I discontinued the use of the bronchoscope indefinitely.

Group Head Surgery.

By B. R. Shurly, M. D.,
Detroit, Mich.

This system will win or fail if guiding hands steer it safely from the shoals of commercialism and fee splitting. If efficiency and humanitarianism are not sacrificed by greed, disloyalty, lack of harmony and cooperation, the group system is sure to win.

The advantages to the patient are self-evident. He realizes fully the necessity of laboratory, X-ray and dental examinations and hospital observation at a fair fee.

The group system adds the danger of machine diagnosis and repair shop methods. It is said that one of our automobile hospitals is so highly specialized that the operating room simillizes the assembling plant to such an extent that one man prepares the field, a second makes the incision, a third operates, a fourth sews up the wounds, and a fifth puts on the dressing, while the sixth, the anesthetist, moves the patient to his room, and a seventh brings in another patient. Humanitarianism is so far removed that the eighth who takes the history is the only one who can recognize the patient on the street some weeks later, if the patient is lucky enough to get there.

Group head surgery must be affiliated with, or control a head hospital and teaching opportunities to be scientifically progressive and efficient.

In our own specialty, at the beginning of the war, regular medical officers were assigned to duty as eye, ear, nose and throat specialists, who were usually without interest or training in the work. Your committee changed this immediately. Group head surgical units were organized and successfully performed enormous labor in this country and abroad. The original estimate of 200 beds in a 1000-bed hospital devoted to Army Hospital work was approximately correct.

ADVANTAGES OF GROUP PRACTICE.

The advantages of group practice are, first, better diagnosis and scientific work, cooperation, mutual interest, conservation of effort, quick service to the profession and the public, the division of labor, specialization along lines particularly interesting to the individual, the pleasure of working among the sick where no man thinks he owns the case, co-operative system in buying of instruments and general equipment, conservation of office space, the use of team work at all times of the day or night, the practical value of an office and hospital together that can be operated by the same staff for the mutual advantage of the patient and the practitioner.

If state and industrial medicine with health insurance are to absorb private practice, it will be necessary to adopt a feudal group system to protect the practitioner and the public who demand private service. It will be of advantage in case state medicine and state hospitals increase to combine with other groups for their personal protection and existence. The success of the group is in relation to the ordinary attributes of industry, intelligence, harmony and a spirit of co-operation, all of which characteristics ultimately receive their full reward.

DISADVANTAGES OF GROUP PRACTICE.

The personal equation is lost between the physician and the patient; the machine and dispensary methods prevail, unless carefully guarded. It is difficult to obtain a group of men who are temperamentally fitted to associate in harmonious endeavor. It is difficult to find practitioners who will always operate under the Golden Rule, but as this is difficult in almost any walk of life, it may not be considered as a disadvantage. It is difficult to obtain men who do not overestimate their personal value and who entertain sufficient broad and humanitarian views to handle patients properly.

Report of Cases of Cancer of the Esophagus Treated by Radium.

By D. C. Greene, M. D.,
Boston, Mass.

It is remarkable that cancer in the esophagus is in the majority of cases well advanced before the patients begin to be troubled by difficulty in swallowing. This accounts in part for the signally unsuccessful results of treatment in a curative way. Pain has

been frequently absent, especially when the middle and lower thirds of the esophagus have been the regions involved. The most favorable location for early recognition is in the upper end of the esophagus, because here as a rule dysphagia and pain occur relatively early.

In the treatment of cancer of the esophagus with radium we are confronted with serious obstacles. Esophagoscopy has rendered the diagnosis of the site and nature of the lesion a relatively simple matter, but it is usually impossible to determine accurately its size and extent. The surface application of radium by means of bougies loaded with radium tubes, has in our hands been productive of only discomfort and aggravation of symptoms without any beneficial results. This method was at best inaccurate and apt to cause burns of the normal epithelium on account of the dislodgement of the applicator from the original position in which it was placed. The method of permanent implantation of small tubes of the emanation seemed to be worth trial and during the past year I have treated a series of eighteen cases by this method. Radium seeds of a value from one to three millicuries have been shown to have an area of effective radiation of about one centimeter. The destruction of the radium is an element of danger which must be reckoned with in placing the seeds, since perforation of the wall of the esophagus into the aorta or into a bronchus may result from an implantation too close to the outer wall.

The technic of the method employed has been as follows: Under ether a medium sized Mosher esophagoscope is passed down to the growth, the field is cleared by suction, and a seed inserted into the most prominent portion of the growth to a depth of about a centimeter. The trocar used for this purpose is made of sufficient length to be passed through a 17-inch esophagoscope and sufficiently heavy and rigid not to bend enough to interfere with accurate placing and insertion of the point when the instrument is held at its proximal end. The usual dosage has been about 5 m. c. in single tubes or distributed in two or three tubes.

The following history is presented as typical: A woman 55 years, consulted me on December 9, 1920, on account of difficulty in swallowing, first noticed six months previously. For the past two months she had been able to take nothing but liquids and these with increasing difficulty. There had been marked loss of weight and she presented a decidedly emaciated appearance. X-rays taken before I saw her showed a constriction of the esophagus just below the arch of the aorta, extending about four inches downward. On December 16th esophagoscopy examination showed a red granular tumor mass obstructing the lumen at ten and three-quarters inches from the teeth. This mass appeared to be growing from the right side, from about three-quarters of the circumference. A very small lumen could be seen in the left anterior quadrant. A specimen was removed for examination and one seed, 7 m. c., was inserted into the center of the presenting mass. A No. 26 French bougie was passed into the stomach. Histologic examination of the specimen was made by Dr. J. H. Wright, who reported squamous cell carcinoma. This patient had two subsequent treatments at three and four-week intervals. The

esophagoscopy examinations showed some sloughing and ulceration of the region of the insertion of the seed, but no noticeable change in the size of the lumen. The patient got along fairly comfortable for three months and had no difficulty in swallowing liquids during this time, and the weight remained almost stationary. During the latter part of March she began to be troubled by cough on taking nourishment. This became so severe that a gastrostomy was advised and performed on March 30th. Five days later she had a severe hemoptysis and died. The autopsy showed an annular carcinomatous mass involving the wall of the esophagus for about five inches from the level of the bifurcation downward. There was a posterior fistula into the aorta and an anterior one into the left primary bronchus. The latter lesion undoubtedly was responsible for the onset of cough.

In only one case was a definite view of the whole tumor obtained, and an opportunity given to insert the radium effectively. The tumor in this case was situated on the anterior wall back of the cricoid.

In general, it may be stated that patients can be given a moderate degree of relief for two or three months by this method. It has been possible to accomplish this degree of palliation with relatively little discomfort from the treatment. Of the eighteen cases treated by this method, fifteen were males and three were females. The tumor was located in the upper third of the esophagus in six, in the middle third in three, and in the lower third in nine cases. The youngest was 45 and the oldest 65 years of age. The average age was 57 years. The average duration of life after beginning treatment was three and a half months. Four patients are under treatment. Only one of these is showing definite improvement in the local condition and in general health. Another, who has been under treatment for five months, is gaining in weight and swallowing better, but the local process as shown by the esophagoscope is still active. The remaining two are rapidly failing. One of these has been under treatment seven months and the other five months. In nearly every instance the patient was able to swallow liquids up to the end and gastrostomy was advised only twice.

Report of a Case of Carcinoma of the Larynx, and One of Sarcoma of the Nasopharynx Treated With Radium.

By John R. Winslow, M. D.,
Baltimore, Md.

The first was a male aged 56. Dysphagia and dyspnea; fairly clear voice; rapid loss of flesh. Sputum and Wasserman negative. Duration of symptoms, nine months.

There was a large lobulated intralaryngeal tumor, smooth, red and without ulceration. It was apparently attached to the left ary-cartilage, with a tongue-like projection into the hypopharynx.

Although the larynx was almost completely filled by the growth, the dyspnoea was not striking. Removal of specimen diagnosed to be carcinoma.

Preliminary tracheotomy followed by seven hours of radiation, externally screened by three millimeters of lead, and held at a distance of one centimeter from the skin.

This was succeeded by immediate dysphagia and a bad skin burn with ulceration of the neck. This took one year to heal.

In about two weeks all symptoms relative to breathing or swallowing disappeared and within a month all trace of the growth had vanished.

The second case was that of a white boy, aged 19, who had difficulty of breathing through the left nostril. He was a mouth breather, speech thick and nasal.

A voluminous tumor was found in the epipharynx, with smooth surface and firm to touch. Specimen showed sarcoma.

Tracheotomy, with subsequent removal of the growth. Recurrence in about two months. This was treated by radium, partly by direct contact, but mainly by needles inserted into the growth. Because of unavoidable interruptions, treatment was extended over more than two years. Patient has been free from symptoms of growth for about a year.

Radium Emanation; Its Advantages Over Radium for Use in the Upper Air Passages. A New Way of Applying It.

By Otto T. Freer, M. D.,
Chicago, Ill.

The limited distance to which the radium rays are therapeutically effective is in part due to their divergence in all directions in the matter of light rays so that only moderately far from their source they become too far apart to influence materially morbid states. The greater the amount of radium or its emanation placed at the source, however, the greater will be the distance to which rays sufficiently close together to give the required therapeutic effect will be projected.

Radium applications to the larynx and laryngopharynx are the most difficult regions for exact and prolonged applications of radium emanation. The applicator is passed into the larynx with the aid of the laryngeal mirror, as in ordinary swabbing of the larynx. Only for the papillomas of childhood are suspension laryngoscopy and a straight applicator needed. The larynx is anesthetized with a 5% spray of cocaine, followed soon by swabbing the laryngeal interior with pure cocaine flakes upon a moist swab. The clamp is then put on with the help of an assistant. Anesthesin powder is then puffed into the pharynx and larynx to heighten the local insensibility. It intensifies the action of the cocaine and quiets the retching caused at times by cocaine in certain throats. The applicator is now introduced, the screen being placed exactly upon the spot in the glottis, upper larynx or fossapyriformis, where it is wanted, while the assistant guides the vertical stem of the applicator into the open jaws of the clamp. He instantly closes upon it when the screen is in the right place, where it stays until the clamp is opened. The saliva pump is then started and the patient left to himself in the assistant's care. Should retching occur after a time, anesthesin powder or a little cocaine spraying will usually stop it without the removal of the applicator, but if

it becomes violent, the applicator is taken out, cocaine sprayed into the throat and the applicator replaced. Retching may often be prevented if the patient retain his napkin hold upon the tongue during the session. Some patients quietly endure the presence of the applicator for an hour or more; others need it taken out once or twice in an hourly session.

For applications to the tonsil and faucial regions, an applicator is used that lacks the laryngeal bend.

For nasal applications a headband is used, upon whose forehead four small clamps are fastened. They consist merely of a piece of brass tubing opened widely enough on one side to admit lengthwise a stem of copper wire with a capsular screen soldered to its end. A set screw penetrates the wall of the tube and fixes the stem at any point desired. The small clamps are affixed to the forehead plate upon their unopened sides. By proper bending of the wire stem the screen may be made to fit into the desired place in the nasal cavity, or pernasally, in the nasopharynx, where it is held in place by closing the clamp.

Six laryngeal carcinomas and four pharyngeal ones were treated with the applicators and emanation. Mention of previous cases treated with radium needling is omitted. Three of the laryngeal carcinomas were intrinsic, involving the arytenoids, the aryepiglottic folds and fossaepyriformes. Three were intrinsic, involving the right vocal cord in each instance. In the extrinsic cases the appearance of the larynx became normal in from four to eight weeks after the last treatment, inspection showing no trace of the growth. So far, no patient has shown a local relapse, but in one the larynx has been invaded from without by rapidly growing glandular tumors. The intrinsic case patients permitted the use of large three and four-case screen in the glottis as long as needed, for a full hour in several instances. In the most extensive of the intrinsic when first seen the carcinomatous mass buried both the right vocal cord and ventricular band, the right side of the larynx being immobile. There was no ulceration. Three weeks after the last of four intralaryngeal treatments of 100 millicurie hours each, the patient recovered his voice, which had been a hoarse whisper for half a year. The right vocal cord regained some of its motion and became clearly outlined, all trace of the carcinoma disappeared. This condition has become stationary, cicatricial retraction binding the right cord partly down. While the disappearance of a carcinoma takes the number of weeks mentioned, almost immediate improvement in the symptoms, preceding the disturbance of the reaction, has been repeatedly seen, as for instance, the melting away of the verrucous excrescences of a papillary carcinoma of the pharynx lying just above the left arytenoid body inside of a week after the first raying.

The treatment of malignant laryngeal disease with radium rays requires a comparatively large dose of emanation, from 100 to 200 millicuries applied at each sitting, in order to reduce the time of the raying to a minimum in the irritable laryngeal region and to flood the territory under treatment to its utmost pathologic limits with rays sufficiently close together to destroy all microscopic carcinomatous implants. Small radium doses can not do this.

**Radium in the Treatment of Laryngeal Carcinoma, With a Review
of the Literature.**

By Fielding O. Lewis, M. D.,
Philadelphia, Pa.

The writer treated sixteen cases of carcinoma of the larynx with radium since January, 1917, with the following results:

One case in which total laryngectomy had been performed, which had recurrence in the thyroid gland, died six months after operation. Another, in whom a complete laryngectomy was performed two weeks ago, has had large doses of radium within the larynx, and radium plaques applied externally for the past year. While doing nicely, it is too early to record accurate results. Another, in which thyrotomy had been performed, with recurrence of the disease in the external wound, was treated by radium needles and died eight months after the thyrotomy. One with early involvement on the right side of the larynx was treated by radium needles inserted directly into the growth, had early retrogression, later showed signs of beginning activity, was thyrotomized. The patient is still living and there is no evidence of recurrence after four months.

The remaining twelve cases, which were considered inoperable were tracheotomized and treated vigorously by introducing needles into the growth and radium applied externally.

In two of these remaining twelve cases there was marked retrogression of the growth, so much so that the site of the lesion was hardly perceptible, and the patient's condition remained so for many months. Recurrence developed, and in spite of the use of radium, they died in about a year after their first treatment.

Out of 109 cases above recorded, ten were living at the time the reports were published, showing a mortality of about 91 per cent.

The method of applying radium in the cases which came under our observation was as follows: The first three or four cases were treated by introducing the capsule, properly screened, into the larynx, after the patient has been thoroughly cocaineized, using a 20 per cent cocaine solution within the larynx, preceded by a hypodermic of $\frac{1}{4}$ grain of morphin sulphate. The radium was held in position after the manner described by Jackson and Janeway. Later, $8\frac{1}{2}$ to $12\frac{1}{2}$ m. g. needles, to which strings were securely tied, were introduced into the growth, the number depending upon the size of the lesion. These were left in position in some instances for seven to twelve hours. In addition to the needles, external applications were also used.

From reports, the writer is of the opinion that more recent, improved technic in the use of radium emanations, as practiced at the Memorial Hospital in New York, offers more encouraging results.

From the writer's experience and from published reports, it would seem that radium is only indicated in the so-called inoperable cases of carcinoma of the larynx, meaning those cases in which there is marked involvement of the cervical glands, epiglottis, base of the tongue, and the esophageal wall. Its analgesic effect in the cases, in moderate doses, constitutes one of the most important benefits. It is valuable for those patients who refuse

operation. It perhaps exercises a beneficial effect in blocking the lymphatics before a radical operation upon the larynx. Such brilliant results have been obtained in early intrinsic malignancy of the larynx by thyrotomy that in these cases radium should not be thought of except possibly as a postoperative measure. In the more advanced type of intrinsic cancer of the larynx, laryngectomy has prolonged the lives of many by surgeons in all parts of the world. Here, again, radium should not be considered a means of treatment except before or after operations.

DISCUSSION.

Dr. Henry L. Swain, New Haven, Conn.: I should like to know whether radium emanations should be used in laryngeal fibromata, and whether these growths will yield to that treatment.

Dr. Henry L. Lynah, New York: I should like to know whether Dr. Freer has made pathologic sections of any of these cases.

Dr. Norval H. Pierce, Chicago: I should say, without equivocation, that the last case that Dr. Freer reported was one of carcinoma. The only possible way to substantiate the diagnosis was by histologic study. Here was a man within the danger zone as to age, who had hoarseness, increasing since January last. There was distinct lagging of the cord, fusiform growth, with more ulceration, I think, than Dr. Freer tells us. If this case recovers, my enthusiasm for radium treatment will be greatly increased. I wish to accentuate that, because I believe that it is a case of carcinoma.

Dr. Cornelius G. Coakley, New York: I have clinically seen similar lesions which had all the appearance to me of being carcinoma; and in all these cases, I feel that it is unwise to regard the condition as carcinoma. One should remove a section, and I have been surprised how often I have been mistaken in the clinical phases when compared with the pathologist's report. Tuberculosis simulates the signs in the chest, and I think it would be unwise to consider it carcinoma.

Dr. Robert Clyde Lynch, New Orleans, La.: I should like to ask whether there was any effect on the top of the cord in the case which Dr. Pierce spoke of, and what Dr. Freer thinks necessary in order to screen the normal half of the larynx while exposing the diseased side?

Dr. Henry L. Swain: I should like to ask whether the flat container can be made to screen one side more than the other?

Dr. Freer (closing): In respect to the various questions, I would say regarding sarcoma that I spoke, perhaps, a little too optimistically about these growths; but my experience has been that they yield readily to radium, and this is confirmed by the literature. Most men speak of nasal sarcomata as singularly good-natured under radium treatment. Many will disappear after simple surgical work. Their good nature is pretty well substantiated. I had similar success with radium in the old days, even when the sarcoma had got back into the nasopharynx and eustachian tube. Of course, there are some that will not do it; but these growths are better natured than are sarcomata elsewhere. With regard to nasopharyngeal sarcoma, I have not had much experience, except when it complicated nasal sarcoma. It disappeared then, with the nasal sarcoma; but I cannot speak authoritatively on the subject.

Even when Sir Felix Semon was writing about laryngology and took such deep interest in carcinoma of the larynx, it was regarded as a dangerous thing to cut a piece off from a carcinoma in the larynx. The danger of squeezing cancer cells into the larynx was, too, regarded as risky. When a thing appears to be carcinoma, I do not like to cut a piece out, unless I intend to take the whole thing away, larynx and all, if it proves to be such. If I intend to treat it with radium, to cut into the growth may spoil my purpose because the cells travel fast.

Regarding Dr. Coakley's thought that the cord was intact, I would say that I cut a piece out of the center of the cord, with the elastic fibers, where there was a chance of its getting better; and leaving the fibres was a bad thing. It looked like carcinoma, and there was no reason to think that it was tubercular. It is hard to mistake tuberculosis of the larynx. The symptoms indicated carcinoma, and I think that I am justified in considering it highly probable that it is carcinoma.

As to screening, we do not want to screen anything in the neighborhood of carcinoma. We want to illuminate everything in the large area about carcinoma. The carcinoma is simply an evidence of widespread infection. Half the neck may be involved. You want to effect all that you can.

Dr. D. Bryson Delavan, New York City: Much time will be required to establish our knowledge of the efficacy of radium treatment in these cases. Meanwhile, more must be learned regarding the effects of the treatment. Many cases must be treated and they must be kept under careful observation long enough to determine the ultimate actual results. This will require a period of years, rather than months. Again, the uses of radium itself and the possibilities of its action must be better understood. For that reason it is most desirable that the work of Madame Curie, the most brilliant investigator in this department, should be continued by her. At the present time our watchword should be "Patience." No doubt it may require several years to establish much regarding it, but in the meantime, it would be well to refrain from opposition based upon theoretical speculation and to study the subject judiciously and with open minds.

Dr. Harmon Smith, New York City: Radium has more effect on sarcomata than on carcinomata, and particularly lymphosarcomata. Those in the nasopharynx yield more readily and quickly than do carcinomata in that region. The question arises as to the application of radium before or after operation. In view of the fact that radium shuts off the channels by which the growth is disseminated, I think it should be done before. A low order of carcinoma of the larynx that disappears with the application of radium is likely to make us draw the wrong inference. Unless we have some more definite evidence than the clinical observation, we cannot yet determine the effect of radium on these growths.

Dr. Cornelius G. Coakley, New York: I wonder whether the method, as employed by the Institute in New York, is not more generally known. They use a pharyngeal tube, of which the proximal end is just external to the lip. The distal end passes over the epiglottis and over the arytenoid, and the whole pharynx is packed with gauze. This does just what Dr. Winslow's technic does, but it

saves the patient from tracheotomy and is just as easy to work with; and I am surprised that this method is not known and employed more in the reports in the literature. The whole tube can be easily taken out at any time, if there is respiratory obstruction; but I have never seen any during even a long anesthesia, when given in that way. It seems to me that the great advantage in the application of radium has been by the seed method, the use of radium emanations being preferable to that of radium salts. The burns that were so frequently obtained in the earlier methods are avoided. I wonder how necessary it is to have such an apparatus as was exhibited to us by Dr. Freer. Dr. Janeway was the first one that I knew of to employ radium within the larynx, and devised a method by which it could be kept there for at least two hours. The statement, as he made it to me, made it seem possible that by simply cocaineizing the larynx, one could give the patient a suitable curved applicator that he could hold in his larynx for two hours. That was demonstrated to me, however; and I wonder whether such an apparatus could not be done away with. It did not seem possible to me that the patient himself could hold it in contact with the exact site of application for the required length of time, but this is so.

Dr. Henry L. Swain, New Haven: I wish to refer to an experience that I had, thanks to Dr. Ingersoll, with a case of apparent lymphosarcoma in the neck. The growth had originally been in the tonsils, and he had been subjected to massive doses of radium within and X-ray without. An improvement had resulted and absolute cure had apparently occurred. The patient was sent to me, to see whether, later on, the man might not need more X-ray—he living near me. I had the feeling that he did not. At the Boston meeting we had him come on; and we saw him and concluded that he was well. He has since died of metastasis, and numerous metastases were found in the abdominal glands, the liver and the lung.

The question arises: Did the massive dosage locally given have anything to do with driving the thing in, as the laity would put it, and as his family think? Or had the case progressed so far that metastasis had started before the radium was applied? That is the probable solution; but we must consider whether the absorption of the products, when so much living tissue is devitalized, and the system disposes of that being formed at the time of devitalization, has anything to do with the future life of the patient. These cases seem like acute Hodgkin's disease in the way that they come up so quickly. The tumor came quickly to its full growth, and then disappeared again; and it seems unlikely that it led to the metastasis that occurred.

Dr. Coakley objected to calling the growth carcinoma which Dr. Freer had treated. It does not make so much difference what it was. It seemed to be carcinoma, and was treated and got well.

Dr. Lewis said something about making radium application to the severer cases. I presume he meant the inoperable ones. I should prefer to hope that very early use of radium might cut the epithelial changes and render operation unnecessary.

Dr. Arthur W. Watson, Philadelphia: It may be of interest to the Association to know that the patient I reported a few years ago as having been treated with radium, a case of carcinoma of

the larynx, is still living and perfectly well. I have examined him quite recently.

In regard to the case reported by Dr. Winslow, a fibrosarcoma of the nasopharynx, it has seemed curious to me that in nearly all cases of fibroma of the nasopharynx that I have seen, and I have seen quite a number, the pathologist's report on a portion removed was sarcoma or fibrosarcoma.

Dr. James E. Logan, Kansas City, Mo.: The description Dr. Freer has just given of his method of applying radium emanations to the interior of the larynx in the treatment of malignant diseases of that organ is very interesting and instructive. With increased experience in this method of procedure he will undoubtedly be able to give to the profession a more comprehensive plan from which we can accomplish more good than has been our experience of the past.

Dr. Winslow's report of the case treated by extralaryngeal application of radium in which a very severe burn followed and a subsequent marked improvement resulted, may open the way to external application of radium or its equivalent, is the method to be employed because of its ease of application, but we have a great deal yet to learn before we can determine what method is best.

It is interesting to note the difference of opinion between pathologists in the diagnosis of intranasal tumors. In one of my cases (Dr. Freer will remember the patient) I removed what my pathologist diagnosed as a spindlecelled sarcoma of the nasopharynx. Recurrence took place six months later, at which time I refused to perform the second operation. The patient went to the Cook County Hospital, Chicago, and the pathologist there diagnosed a simple fibroid tumor. A second operation was attempted and the patient died on the table. We are never certain of recovery in these cases.

Many years ago I reported a case of round celled sarcoma, recovery after eight years of no recurrence after operation. The patient finally died of a sarcoma of the pancreas. Of course, we have all removed nasal growths with the electrolytic needle and also by galvanocautery without recurrence, so I take it that we are at least progressing. Recurrences have been prevented by the use of radium on tumors located in other parts of the body, suggesting, as I believe, that surgical interference in the first place should be followed by the use of radium, or as suggested by Dr. Smith, we might use the X-ray first, then surgery, and then radium.

Dr. Norval H. Pierce, Chicago: I rather antagonize the view that Dr. Coakley put forward in regard to always substantiating the laryngoscopic diagnosis of cancer of the larynx by microscopic examination. Of course, this is a very old and much discussed question; and I believe that it is a dangerous formula to have such extensive credence among laryngologists. I have been rather extensively criticised in Chicago, by some of my colleagues, for holding the viewpoint that whenever we can escape cutting into a carcinoma of the larynx for microscopic examination, we should. Regarding the case that Dr. Freer reported today, which I saw: Here was a fusiform infiltration of the vocal cords in a man sixty odd years of age. The cord lagged. He was hoarse from January until May. There had been some hoarseness preceding this. Ul-

ceration was very marked when the tumor was touched with peroxide of hydrogen. What could this have been?

First, we think of carcinoma; then tuberculosis, syphilis and ordinary lowgrade inflammation, so-called. Against the latter was the fact that this man's larynx was entirely healthy, with the exception of this growth on the vocal cord. There were no other infiltrations; no other thickenings.

He had never shown any evidences of tuberculosis. There were no tubercle bacilli in his sputum. It could not have been tuberculosis.

It could not have been syphilis. He had three or four Wassermanns made. He never had had a history of syphilis. He was rather a moderate gentleman in his habits. His spinal fluid had been examined and was negative to Wassermann.

Now, suppose we had cut into this man, and instead of being impure scientists, we had become pure scientists and destroyed this man's vocal cord. That would have been the only way that we could have done it, because it was an intramural affair. You could not have done it from the surface. It would have been necessary to take a large piece for diagnosis; not a small piece. Then, such enough, we have a carcinoma of the larynx. Then the picture or prognosis is entirely changed. At best, he would have had an area of ulceration under radium, with a destroyed voice. At is it, so far, Freer tells me, his voice is good and the tumor has disappeared. I would rather be an impure scientist and have an impure scientist handle the case under these conditions.

Dr. C. J. Coakley, New York: Two or three times a year it happens that cases are referred to me for an opinion, in which other men whose opinions I regard as most valuable, have made a diagnosis of carcinoma of the larynx. I invariably, in these cases, remove a section, if I am not frankly able to confirm that diagnosis. If I find the pathologic report not satisfactory, as it may not be,

I take a second piece before I am willing to submit that patient to the operative procedure advised by previous surgeons. If you are going to carry out Dr. Pierce's idea, you must not put anything in the larynx, such as a swab, which is going to bruise it. I do not believe that Dr. Freer has a technic by which he can remove the larynx without bruising it and squeezing the epithelial cells. Nor must we put radium in, because we are bruising the larynx also by this procedure. I do feel that it is not wise to subject a patient to a serious operation without being sure of your diagnosis. No man should have a section taken unless he is willing to go on with the surgical means necessary in the case.

Dr. H. H. Forbes, New York City: Emanations are not new to us. We have followed out, in the radium work in the hospital, a combined system. In other words, while I feel competent to put in either the needles or emanation, I do not feel now that, with our limited experience in simply the growths of the pharynx, esophagus and larynx, I am in quite a position to judge the quality and quantity or the type of material to be used in these new growths. All the men who are interested in the Endoscopic Association realize that, with our technic, we are able, not only to view the parts, but also to make the examination. With Dr. Coakley, I

feel that if it is possible, we should remove sections. We are then able to treat the cases and watch them.

There are two or three points that occur to me. One is that we have discarded entirely the so-called tubes or capsules in our esophageal and laryngeal work. We are using the needle. We have not the facilities for preparing the seeds of the emanation element, where the gas is formed. Whether we shall have to come to that, and give up the needles, I do not know. To be candid, it seems to me that those who are using the emanations are getting better results than we who are using simply the needles. If there is an objection to using the needle and there is a possibility of infection from their use, the same possibility would apply to the seeds. To avoid that, we have used a thoroughly aseptic method of preparing the patient, with alcohol or iodine used over the surface of the growth before using the needles. However, I do not believe that it is entirely the fault of our method of treatment.

In regard to the question of screening, I do not feel that the gentlemen have emphasized it sufficiently; and while I have only an opinion to offer, I do not think that, with an element as active as radium, we should expose normal tissues to it yet. I cannot feel, in my own mind that radium is going in there to destroy simply the abnormal tissue and not to destroy a certain amount of normal tissue. I think that the reaction is going to be on the normal tissue also. Unfortunately, the cases that we have had have not been of the type Dr. Freer spoke of in reporting his case of apparent cure in the larynx. I do feel, from the advanced cases that have come to us, among which we have had a number of deaths, that if I were to see these cases over again, I would not expose them to the radium treatment.

Dr. Henry L. Lynah, New York City: I believe that most of the lung abscesses are due to aspiration, because all of the surgeons agree that embolic cases die rather early. The patients which I have had the good fortune to bronchoscope are all still alive. In washing out the abscess cavities as advised by Yankauer, I never have been able to recover any of the solution by suction, for it is always coughed out through the bronchoscopic tubemouth as fast as it is injected. Personally, I believe that the dilatation of bronchial stenoses and the establishment of proper lung drainage is what improves the cases. I only use suction after bronchoscopic dilatation, and seem to have obtained some results. Bleeding, edematous and fungating granulations are always touched with ten to twenty percent nitrate of silver. As to the injections of bismuth subcarbonate in olive oil, that was not done with any idea of curing the cases, but was purely for purposes of definite localization of the abscess cavity. All of the patients, however, improved. Dr. Wm. H. Stewart attributed the improvement to the secondary action of the X-ray on the metallic substance in the lung. We have had bismuth remain in the lung for ten months after injection, but often when the bismuth disappears the abscess is healed.

In cases following tonsillectomy early bronchoscopic examination is always indicated while the process is in the pneumonic stage and before definite cavitation has taken place. We have had some startling recoveries in these early cases after removal of the

sloughs from the edematous bronchus and bronchial dilatation and aspiration.

Dr. Robert Clyde Lynch, New Orleans: I have had seven cases of which four have died. They were treated by the use of needles. I have used only twenty-five milligrams of radium. The needles were planted right into the growth and left for four, six, eight and twelve hours at a time. We made the patients more uncomfortable by this procedure, instead of giving them analgesia. They suffered more intensely than if they had been left alone; and I believe that they died sooner than they otherwise would have.

Talking about Dr. Smith's remark concerning a case that he reported, two or three years ago, in which he did laryngectomy after a previous application of radium, the cuts show what looks like cartilaginous tissue. There was tremendous sloughing of the parts, and the man died from the sloughing process.

If operation is decided on, the time for the application of radium is after the operation, rather than before, on that account.

I want to ask Dr. Freer whether the radium seeds that he used contain four hundred millicuries of radium. Dr. Freer's results were so different from those that I have been able to see in the cases of the men who have been using radium in my section of the country and in the reports from other sections, that I was wondering whether the tremendous difference in the content of the element used accounted for his results as compared with ours. In my section of the country, we are disposed to be a little pessimistic about the results of radium around the mouth and upper esophagus. Our results, not only in my own hands, but also in those of Matas and Miller, and those who had considerable experience in operative work in the mouth and throat, are poor, and, in a general way, we are disposed to be pessimistic about the results obtained in the mouth, pharynx and upper esophagus.

Dr. D. Crosby Greene, Boston, Mass. (closing): I wish to call attention to the fact that I did not claim in my paper to have cured any patients, but that they had been relieved. The method has been palliative in the majority of cases. With seed implantations one gets necrosis of the part of the tumor which presents in the lumen. The patients have reported as being more comfortable and swallowing better. The end results have, however, been bad in all but one case. Nevertheless, I think that the method gives some promise of accomplishing more, so I intend to continue its use, hoping to gain increasing effectiveness by combining its use with that of Dr. Duane's new X-ray apparatus, which promises to be more effective than anything yet produced in that line. With regard to Dr. Freer's apparatus, I feel that in the face of the results that he has reported, if he continues to get such results, we must acknowledge that he has made a great advance in the application of radiation within the larynx. Our experience at the Huntington Hospital has not been like his. We have had some good results from radiation and I expect to show next week in Boston two cases of apparent cure of cancer of the larynx by radiation. In one case one and a half years, and in the other two years, have elapsed since the procedure was undertaken. Our results following the method of surface application of the radium to the larynx have not been so successful as Dr. Freer's. We have not had such an

ingenious method of application as he has produced and I wish to pay tribute to his ingenuity and skill in administering radium in this way. I have found almost always a considerable amount of inflammatory reaction following the application of radium in the larynx; so much so that I have performed as a routine, preliminary tracheotomy. This does no harm and is the only way to forestall severe dyspnea which is apt to come on during the period of reaction, so that the cure can be attributed to the radium only. But our records of surface application to the larynx have not been as successful as Dr. Freer's. We have not had such an ingenious method of application as he has produced, and I wish to pay tribute to his remarkable ingenuity and skill in administering the radium emanations in this way. I have found, almost invariably, a considerable amount of reaction after the application of radium in the larynx; so much so, that I do a tracheotomy beforehand. It does not do harm in these cases, particularly if there is sufficient infiltration to narrow the space so that breathing is difficult. Anyway, I think that it does good in itself, and avoids the danger of acute stenosis of the larynx in the bad cases.

Dr. John R. Wilson, Baltimore (closing): The important point in these cases is diagnosis. For that, unless exceptionally, we are dependent upon the pathologist. To make sure, I resorted to three pathologists, and none of them agreed. The last examination was made of an alcoholic specimen, some two years after the operation. It is possible that, by maceration, the appearances were altered in some way; so that what was originally a roundcelled sarcoma gave the appearance of a spindlecelled sarcoma or fibrosarcoma. I do not know whether that is possible or not. The laryngeal case that I reported could have been treated by any method. It happened that at that time the more recent methods were not known. The skin burn was due to inexperience, as it was one of the first cases of laryngeal tumor treated in this institution. It seems to me that Dr. Freer's doses are enormous. I am not responsible for the physical side of the treatment. The tubes given me were represented as emanations of pure gamma rays. How they get the gamma rays isolated, I do not know. They were handed to me as pure gamma rays, and were certainly active.

Dr. Fielding O. Lewis, Philadelphia (closing): Relative to the length of time that the patients are able to retain these applications in the larynx, I might say that we used preliminary tracheotomy in our cases, because we found that the reaction was so severe that tracheotomy had to be done later. There was also an added advantage in putting the larynx at rest. Dr. Swain stated that he would prefer to use radium in early cases of carcinoma of the larynx. I feel differently, because in cases treated by radium there are so few cured; whereas, in thyroidectomy, about 75 or 80 per cent of cures are obtained when the cases are seen early.

Regarding biopsy, I feel that there are borderline cases in which it is necessary to remove a specimen. In the case of an old man that I saw six months ago, in which I asked Dr. Jackson to cooperate, there was a small ulcerated growth of a few months' duration on the vocal cord. His Wassermann and other examinations were negative by direct laryngoscopy. I removed the growth in toto; and histologic examination of the growth showed it to be simply a papilloma with an ulcerated surface.

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